INDEX

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EDITORIALS

THE ECONOMIST AND HIS RELATION TO THE PROBLEM OF CONSERVATION OF HUMAN RESOURCES.

In the December number of the Economic Bulletin we read:

"Anyone examining the third quarter of volume II of the Bulletin of the International Labor Office must be struck by the progress in legislation for industrial hygiene. That the labor problem is at bottom a question of health, and that it can best be approached from that side through legislation is a conviction that is becoming world wide." (Page 238.)

This brief statement represents the best thought among many of the leading economists of today. They have studied birth rates and death rates practically from the beginning of economic science but until very recently they did not go back of the birth-rate or death-rate to investigate the influences which controlled these; and when they did go back to examine these conditions they did little to improve them, if they were not satisfactory.

THE PRESENT MOVEMENT.

During the last quarter of a century, however, the economists have made remarkable progress in getting at the real heart of these problems. They have been investigating the physical as well as the social environment of the people in their homes, factories, workshops, offices, and public places. First they made surveys of these conditions and estimated the suffering and loss entailed on account of unsatisfactory environment. Following this they have secured expert testimony as to what steps might be taken to stop this loss—human and economic—and suffering. And having remedies prescribed they are now actively engaged in trying to educate the people to the economic advantages which would accrue from an improvement; and at the same time they are constantly working for laws which will compel the ignorant, the indifferent, and the greedy to improve conditions and thus reduce the loss and suffering.

FIELD OF OPERATION.

The field being covered is a broad one. It ranges from the home to the factory. It covers the question of hours of labor and the effect of this labor upon the human system, but it also considers the effect of foul air and not enough ventilation; of crowded conditions whether in the home, public places, or factories; of too high or too low temperature in these places; of humidity in these places; of light, etc. This is the field now generally spoken of as Industrial Hygiene.

But the question of environment is not now receiving all of the attention of the economist in his effort to preserve the human resources of the country. The question of food is recognized as a vital one. Hence the careful studies which are being made of the status of the underfed. This study extends to the question of underfed school children as well as suffering in cases of unemployment. When action is taken it results in municipal or state bread lines and lunches, as a successor to those supplied by private charity.

But the question of the underfed is only one phase. Pure food is as important as enough food and the pure food laws regulating factories are illustrations of the reforms which most economists now stand for.

Still another field now coming to the attention of the progressive workers is that embodied in the term "Industrial Accidents." Bureaus of statistics, labor and industries are now busily compiling data on this subject. Many good laws have already been secured especially in European countries; in the United States we are making a beginning. Two distinct species of remedial legislation are demanded. The one intended to prevent accidents, the other to provide for the injured in cases where prevention has not been possible. Under the first class comes the demand for guards over dangerous machinery, etc.; under the second comes the various provisions for working men's compensation, accident insurance, etc.

The volume referred to at the beginning of this paper illustrates the movement as well as any recent periodical from any of the branch organizations of economists and co-workers. To illustrate, I quote a few of the titles to laws, resolutions, or orders of state departments which have a direct bearing upon the subject.

German Empire: "Notification respecting the establishment and management of works for the manufacture of alkaline chromates." (Page 352.)

Prussia: Act respecting a further grant of public money towards improving the housing conditions of workmen employed in State undertakings. (Page 356.)

Austria (Vienna): Resolutions of the Town Council respecting the prohibition of the use of paints and colors containing lead and of red lead, in municipal works. (Page 360.)

Denmark: Regulations for shoe factories. (Page 371.) (These regulations cover light, air, sanitation, rest rooms, mess rooms, etc.)

France: Order of the Minister of Public Works, touching safety apparatus to be maintained in mines. (Page 378.)

Circular from the Minister of Labour, addressed to the Divisional Inspectors, on the heating of premises used as work places. (Page 381.)

Act, relating to hygiene and sanitation in mines. (Page 384.)

This list could be developed into a volume which would be a very complete bibliography of the activities in this line of

effort. With economists now entering the field and assisting as they are able by investigation, education, and securing legislation, those who are devoting all of their time to the conservation of human resources may feel that they are gradually gaining able support and public opinion in their favor, and may feel confident that their successes in the past have been but the fore-runners of what is to follow.

JOHN LEE COULTER.

[Asst. Prof. of Economics, Univ. of Minn.]

THE SALOON AND THE HEALTH OFFICER.

The saloon may be accused of contributing to disease by contributing to poverty—by diverting wages from milk and eggs to whiskey, from good clothes and fresh air to rags and fetor; by rendering its patrons more susceptible to disease and more likely to encounter it, less able to withstand exposure to bad weather, and more likely to be exposed; all this and much more is too well known for comment. But there is another aspect which is particularly evident in the small community. In the large city the saloon element is notoriously a large factor in municipal government, but there are other factors also and the saloon devotes itself somewhat strictly to certain lines of endeavor. In large cities Boards of Health are sometimes more free from political influence—hence, more free of saloon influence—than are the other municipal departments. But this statement applies much less to small communities, and it is there that the saloon element is usually most openly prominent in politics. The small town or village almost always is split into two groups—saloon and anti-saloon. The saloon element contains within itself the watchful, loose-tongued, speculative male gossips of the community—the active talkers and thrice-active voters. The anti-saloon element contains the more exclusive, stay-at-home, attend-to-own-business element, the people who don't vote, or if they do, vote usually for the supposedly lesser of the two evils offered in the nominations made by the active, i. e., saloon element.

Thus it is that the medical health officer, representing officially the progressive, humane, altruistic, uplifting department of the city government—the apotheosis of his own profession—finds himself too often in reality the agent of an administration designed, planned and carried out for the sole benefit of the exploiters of the unfortunate. If he is strict in his office he offends these his masters, and at the same time receives no real encouragement from the better element. If he is not strict, he degenerates, and his community, from a hygienic standpoint, degenerates with him. The choice which this office holds out to the practising physician is on the one hand to be a good fellow, soften, evade, hush up, when the saloon crowd might be hit by

his operations, thus enlarging his clientele; or to do his duty, offending possible patients, receiving the cold shoulder from administration associates, finding from day to day obstruction, evasion, delay and deceit, in both official and unofficial information given him in his official capacity and a series of traps set for him in a thousand ways to catch him napping and give him a black eye with the State Board of Health or with the citizens generally. It is the writer's experience that this history with the histories of the choices made by practitioners when they become health officers, would form an outline history, only needing names, dates and specific details, of very many small communities. A rather important corollary, which the vital statistician should heed well, is that in plotting the curves of contagious diseases for a given community for a series of years, he should not attempt to correlate the fluctuations with changes in the water supply, etc., etc., until he has first plotted them against changes in the personnel of the health boards, and the character of the changing administrations of the municipality.

The practitioner is rarely a man shrewd in handling people outside of the sick room, and rarely has any well defined moral position. Being a practitioner he rarely feels called upon to assert himself as a citizen. Pitchfork such an average man into an unknown position, full of technicalities mixed with much very human human-nature and give him his choice between going with or against the current in a matter where he is not expert and he is at once out of his element. Taught by precept and example and compelled by the very nature of his work, to be an individualist, to deal directly with his patient, purely as a therapeutist, to ignore his patient's faults or failures in all directions and think of him as only a sick man needing professional care he becomes used to a certain definite attitude towards others. Remember that the practitioner deals usually with voluntary patients, i. e., those who come to him, respectful, confident, for personal advantage to themselves. In the sick room he is an accepted, chosen, idolized dictator—or he is discharged. But as a health officer he must make people who did not choose him, do things they do not want to do, for the good of others, not for their own. He must look upon their acts not as the acts affect them, but as they affect others. He must appeal to them

upon unfamiliar altruistic grounds and enforce his orders in unfamiliar legal ways. It is not pleasant for him to explain to his personal patients, admiring, confident, dependent on him, why they should be put to trouble and expense at his order, to protect their next door neighbors, perhaps adherents of his competitor in private practice and constructively "knockers" against himself. He would not be human if he did not feel the pressure—even though he do not succumb to it—to lighten the hygienic burdens of his own families and bind them more firmly on those of his competitor. All the more so is this the case if his competitor is on the other side of the eternal saloon question. In a small community every one of the physicians is classified on one side or the other voluntarily or involuntarily. Eyes follow his every move. He is set down as "a good fellow who takes his drink and has his fun like the rest of us," or a crank. There seems to be no middle ground. The saloon, basing its arguments for existence on liberty of conscience and opposition to one man's ideals governing another's, nevertheless insists that while liberty to drink or not to drink is a God-given right, it must be exercised to drink, not to abstain from drinking.

It must be said that the saloon does not wholly make what is popularly known as the saloon element. In every community, male gossips, loose, watchful, speculative, venal, are to be found. It is unfortunate, but it is true, that the saloon attracts, consolidates and leads this element peculiarly; not exclusively, but in such a majority that the sum total result is of direst influence, on municipal government in general and on public health questions in particular.

H. W. HILL.

THE ARRANGEMENT AND PHRASING OF PUBLIC HEALTH REGULATIONS.*

Editor's Note.—Amongst the multifarious duties of the professional public hygienist, not the least important is the preparation of rules, regulations, ordinances, etc. This involves some knowledge of what is required from a hygienic standpoint, what can be demanded from a legal standpoint, what can be enforced from a political, psychological and sociological standpoint; and finally the ability to express the essentials clearly, in good English, and with enough formality to give coherence and dignity. The writer of this editorial has illustrated many defects in the specific case of milk ordinances: but the criticisms he makes and the principles he lays down apply to all such matters and are well worth considering carefully.

"Thou shalt not steal." A modern writer of ordinances would be liable to phrase this injunction somewhat as follows:

"Thou shalt not take, remove, carry away, convert to thy own use, or in any way acquire control or possession of any article, substance, compound, or other property belonging to any person, firm, or corporation, without his, her, its or their knowledge, and without giving to him, her, them or it, an equivalent therefor, whether with or without an intent wrongfully to deprive the aforesaid person, firm or corporation of the possession and enjoyment of full rights in his, her, its or their property."

This is no exaggeration of the circumlocution and verbosity of many dairy laws, as the following which I found in the ordinances of a leading city, is proof: "If any person or persons refuse to comply with or wilfully connive at or assist in a violation of any of the provisions of this ordinance, or whoever in any manner interferes, hinders, obstructs, delays, resists, denies, prevents, or in any way interferes or attempts to interfere with the city chemist, assistant city chemist, or milk inspectors, or police officer, in the performance of any duty herein enjoined, or shall refuse to permit such officials or others to perform their duty, by refusing them or either of them, entrance to any premises where milk or cream is stored or kept, or where cows are stabled or kept, or refuses to permit any animal to be viewed or inspected or any milk or cream to be viewed, inspected, tested

* This editorial is part of a paper read before the Iowa Association of Health Officers, Oct. 27, 1909.

or analyzed, or samples to be taken for such purposes, or conceals any milk or cream; or any milk-wagon driver, milk peddler, or milk vendor, who, with his wagon, carriage, or vehicle containing milk or cream, or any person delivering milk or cream by the hand, runs or drives away, or attempts to run or drive away, or conceals or attempts to conceal any milk or cream in his possession, custody, care or control, from any of the officers aforesaid on being approached, or hailed, or addressed, by any such officers in the performance of their duties, shall be deemed guilty of a misdemeanor and fined not less than twenty-five dollars nor more than one hundred dollars for each and every offense."

Had the market milk business been of any importance in the days of the decalogue, the eleventh commandment would have been simply:

"Thou shalt not sell dishonest or impure milk."

That covers the whole case. Adulterated milk is dishonest. Milk that is materially below the average product in composition or that has been skimmed is dishonest, unless the consumer knows what he is buying. Dirty milk is impure and dishonest. Milk with high bacteria count is impure and dishonest.

In writing a milk law or ordinance to-day the following rules should be observed:

First. Avoid unnecessary verbiage. Many words and vain repetitions do not increase the effectiveness of a law. I have already given an illustration of foolish multiplication of words; as this may be regarded as an extreme case, I quote another. The law in a number of places prohibits the sale of milk "which has been watered, iced, adulterated, reduced, or changed in any respect by the addition of water, ice, or other foreign substance, or any adulteration or preservative, whether placed therein for the purpose of artificially increasing the quantity of milk, cream, or buttermilk, or for preserving the condition or sweetness thereof or for any other purpose." This prohibition contains FIFTY-SEVEN WORDS; it could have been as strongly expressed in TEN WORDS by merely prohibiting the sale of milk "to which water or any foreign substance has been added." In law as in rhetoric the concise, simple form of

expression is desirable. The repeated allusion to "person, firm, or corporation," and the awkward repetition of the pronoun "his, her, its or their" in the opening sentence of this paper is not imaginary. They can be found in actual laws. A law is just as strong to use merely the word PERSON with a provision—once for all— that "for the purpose of this act the word person shall mean individual, partnership or corporation"—FIFTEEN WORDS. One State secures the same result by saying that the "word person as used in this act shall be construed to impart the singular and the plural as the case may demand, and shall include corporations, companies, societies, and associations"—THIRTY-ONE WORDS.

Second. Arrange in logical sequence. The mandatory section which is the only absolutely essential portion, should come first, followed by the provisions for helping to secure results. This is contrary to the prevailing practise which often gives the right of the line to a matter of mere detail, to-wit, the issuing of licenses or permits—having dealers licensed is a great convenience in enforcing a milk law but is entirely non-essential. A law will "hold" in court if poorly arranged, as it will if too wordy, but it is not necessary to violate every rule of English composition when drafting a milk law.

Third. Omit self-evident matters. It is nonsense to enact as has been done in more than one case, that an inspector shall be a COMPETENT PERSON, that a chemist shall make CORRECT ANALYSES, that an inspector shall HAVE A RECORD BOOK and keep CAREFUL RECORDS, or that a chemist shall have NECESSARY APPARATUS. I have found one law which directs the testing of milk "with such instruments as are used for such purpose." Some places think it necessary to define the words MILK and CREAM.

Fourth. It is unnecessary to enact matters which ordinary rules of evidence will take care of. I have found this: "The person securing said sample may securely pack and box said sample and send the same to the State Chemist, or other competent person appointed hereunder for the purpose of making examinations or analyses of samples, and his testimony that he did procure the samples and that he sealed and numbered the same as herein provided and that he wrote his name thereon

and that he packed and boxed said sample and sent the same to the State Chemist or other competent person appointed hereunder to analyze such sample and the testimony of the person to whom said sample is addressed that he received said box or package in apparent good order; that said sample was sealed and that the number and name of the sender, as herein provided for, was on said sample, and that the seal at the time the same was received was unbroken, shall be prima facie evidence that the sample so received is the sample that was sent and that the contents thereof are the same and in the same condition as at the time the person so procuring said sample parted with the possession thereof, and the testimony of said two witnesses as above shall be sufficient to make such prima facie proof." This same principle holds true in the question of agency; it is idle to enact that the act of an agent within the scope of the duties of his position shall be deemed to be the act of the principal. It is foolish to put into formal laws as does one city that an inspector in taking a sample shall "cause the milk or cream to be thoroughly mixed by stirring or pouring."

Fifth. Refrain from violating fundamental, constitutional principles. For instance: Every defendant is entitled to confront and cross-question witnesses who appear against him, and the frequent provision of milk laws that the affidavit of a chemist "shall be accepted as evidence" is worthless if contested. One law says: "The results of (the chemists' analysis) shall be taken as correct."

Sixth. Avoid generalities and things that cannot be enforced. Do not require "properly constructed stables" or forbid the keeping of cows "in a crowded condition." It would be difficult to maintain successfully a court case based on such vague language. One law that I have seen requires that milk shall be sold as "soon as possible" after it is drawn from the cows; another, that "cows shall be allowed to be in pasture four hours per day, weather permitting." One city says that "animals shall be allowed plenty of out-door exercise" and in another law I read that "cows shall be fed liberally." Such sentences, as laws, are not worth the paper they are printed on, though as educational suggestions they would have a value.

Seventh. Do not put upon the government the burden of unnecessary proof. If you forbid adulterating milk "with poisonous substances" as is the law in many cases, you must prove adulteration and also that the adulterant you find in the milk is actually poisonous. One law prohibits the "use of any substance added for the purpose of MODIFYING THE PHYSICAL PROPERTIES of said milk or cream." In one place the law prohibits the feeding to cows of food "which will produce milk which is unhealthy or unwholesome." Such laws unnecessarily increase the proof needed to succeed in court and therefore increase the work of prosecuting cases. This always helps the law-violator. On this principle, the word "knowingly" is now generally omitted from food adulteration laws.

Eighth. Use care in phrasing sentences. Do not throw common sense and grammar to the winds when you attempt to draft a milk ordinance. I have already alluded to the importance of using reasonably good English in the construction of milk law. But I repeat the suggestion with emphasis, and add that there should be no gross errors in the sentence-making. Such advice would be superfluous were it not for some strange specimens that may be found in the milk laws of some cities. A prominent city has this mandate: "Every person offering milk for sale from a cart or other vehicle shall be painted on both sides thereof," etc. Another city has a regulation about milk "drawn from any cow having a temperature or which has been kept at a temperature higher than 50 degrees F." In another place there is a requirement that "the bodies of all milk cows including their tails, shall by such person, firm or corporation be kept in a cleanly condition by means of brushing and washing." The word "otherwise" is sometimes overworked, as in the law requiring that an inspector taking a sample of milk shall "seal with proper seals or otherwise." Another frequent fault in milk laws is in the clause which fixes a standard of total solids, for instance, of 12 per cent., and adds "of which 3 per cent. shall be fat." Three per cent. of 12 is 36 hundredths of 1 per cent. which is the legal amount of fat in milk when the law is worded as above, although 3 per cent. of fat was intended. One city has a law requiring proper facilities for "washing OR sterilizing" dairy utensils.

So much for the LETTER of the law, which is important. But the SPIRIT of the law is of even more concern. In the agitation for a law before its enactment, and in its enforcement after enactment the spirit of the law is of the utmost importance and must always be clearly in mind. The purpose of the law is to prevent the sale of dishonest or impure milk, and dairy laws are needed for three reasons:

First. A minority of producers and dealers are dishonest.

Second. A minority of the same are negligent.

Third. Some producers and dealers are ignorant.

The great mass, who are in neither of the above classes are the intelligent, careful and well disposed dairymen. In enforcing milk laws we should cause these producers as little trouble as possible. Necessarily they will be put to some inconvenience; they must secure licenses, or permits, and must pay therefor; their wagons must be stopped on the street and samples taken; their dairy equipment and methods must be regularly inspected. The rain falls on the just and the unjust. Though in some respects the law-abiding dairymen must be treated the same as the worst scamps, officials should perform their duty so tactfully as to give no offense and if possible to win friends for the law and its enforcement. Further than this, if the inspector is fully competent and judicious he may as an incident of his work, be of great assistance to these dairymen as some offset for the trouble caused. Even if their conditions are so good that they are safely within the law, their establishments may be far from perfect and may be susceptible of much improvement. If the inspector gains the confidence of these farmers and makes an occasional suggestion with good judgment there will be a steady improvement in the dairy conditions of even those who are in the better class, and who are clearly law-abiding citizens. The law will have another benefit to the intelligent, honest dairyman. It will help his business by saving him from the competition of the ignorant, negligent and dishonest, by keeping dishonest and under-grade milk from the market and by raising the dignity of the milk business.

GEORGE M. WHITAKER,
U. S. DEPT. OF AGRICULTURE.

American Public Health Association

REPORT OF AN EPIDEMIC OF PROBABLE PARA-TYPHOID FEVER.*

By ALLEN W. FREEMAN, M. D.,
Assistant Commissioner of Health, Virginia, and

HARRY T. MARSHALL, M. D.,
Professor of Bacteriology, University of Virginia.

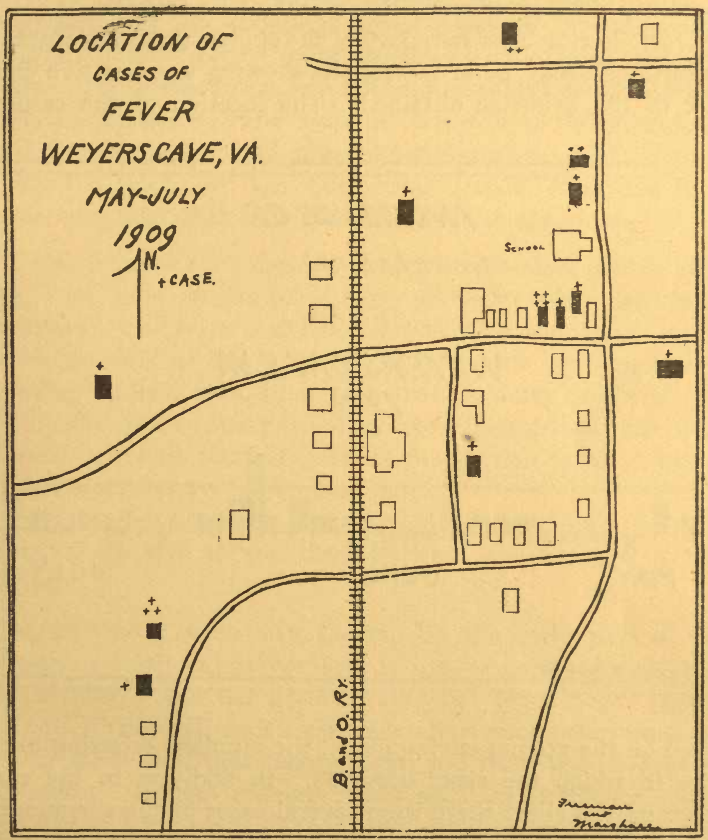
The following epidemic is reported, notwithstanding the fact that the diagnosis could not be definitely established by the isolation of the specific organism, for the reason that it presents features markedly different from those of the typhoid fever to which we are accustomed in Virginia, and that the results of agglutination tests make it highly probable that it was an epidemic of true paratyphoid fever.

In the latter part of June of the present year (1909) an unusual prevalence of a disease supposed to be typhoid fever was reported to the State Department of Health of Virginia from the town of Weyers Cave, Virginia. Weyers Cave is a town of about three hundred people, situated in Augusta County at the upper end of the Shenandoah Valley. The town is built on both sides of the Valley Branch of the B. & O. Railroad, on a series of rolling hills. Geologically the town lies just across an important fault, half the town being built on a limestone formation and half on shale. Prior to the present outbreak, the town had been free from any continued fevers for at least three years, and there had been no marked outbreak of typhoid fever during the period within the memory of any of the inhabitants. The surrounding country has been, however, for many years heavily infected with a disease known locally as Valley Fever, supposed to be a mild form of typhoid.

Beginning on May 26th, cases of the disease in question began to appear, but the situation was not regarded as serious until late in June. In all, 27 cases were reported to the Depart-

Read before the American Public Health Association at Richmond, Oct., 1909.

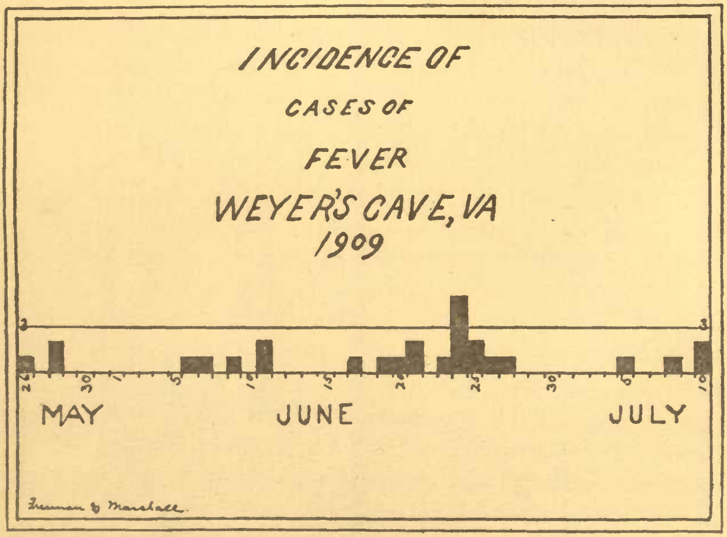
ment. A preliminary investigation, made by one of the writers representing the Virginia State Department of Health, disclosed the fact that the disease presented clinical features markedly different from those of the typhoid fever to which we are accustomed. At the time of our first visit most of the cases had already recovered; the cases were exceedingly mild, being usually



afebrile by the ninth day, and the patients made a rapid convalescence. None of the patients were seriously ill, none exhibited symptoms of perforation or hemorrhage, and no case presented a typical typhoid picture. In view of this fact, and of the fact that the preliminary epidemiological investigation was totally negative as to the cause of the epidemic, preparations

were made at once for a thorough study of the disease. A temporary laboratory was established in the village, the writers and two assistants conducting the investigation. This laboratory remained on the field about two weeks, and subsequently further bacteriological work was done in a temporary laboratory located in the City of Staunton, twelve miles distant, where facilities for laboratory work were more convenient and adequate.

The following brief summary of the epidemological features of the outbreak may be of interest as showing the negative character of the evidence obtained. The location of the cases is



shown on the accompanying chart, the numbers referring to the order in which the cases occurred. In addition to the cases shown on the chart there were several cases in the surrounding country, at a distance of from one-half to one and one-half miles from the village. A study of the chronological chart leads to the impression that some general cause was operative in spreading the disease. The concentration of cases at intervals of seven to ten days is very suggestive of such a cause, and the period between the first cases and subsequent ones, suggests the fact that the first cases were the source of the infection.

WATER. Most careful investigation was made of the water supply of the cases. There is no general water supply for the town, the inhabitants depending upon individual cisterns, wells, and springs. Fourteen of the cases used well water exclusively, being in nine different houses supplied by nine different wells; six of the cases used cistern water exclusivley, being in six different houses with six different cisterns; one of the cases used spring water exclusively; six of the cases used a combination of waters. There was absolutely nothing in common in the water supply of the cases. The wells on one side of the village are driven in shale and on the other side in limestone. The cisterns had for the most part been filled from rains in April and there was no rain from that time to the end of the epidemic.

DAIRY PRODUCTS. Each of the infected houses had its individual cow, kept on the place and milked by some member of the family. So far as could be learned on most careful examination, no milk or butter is sold in the town, the inhabitants depending entirely upon their own cows for dairy products.

Only two of the cases were supplied with ice prior to the onset of illness, and this was artificial ice made from distilled water, and sent from a city twelve miles distant.

Owing to the season of the year no shellfish were in use nor had any been sold in the town for two months prior to the outbreak.

FRESH VEGETABLES AND FRUIT. In the early part of the outbreak no fresh vegetables were in use, as none were shipped in from outside and the gardens were not producing. In the later part of the outbreak some vegetables were being used, all from the gardens of those using them, and there was no general distribution. Human manure is not used for fertilizing. Suspicion was at one time in the course of the investigation directed to the fact that the onset of the disease was coincident with the ripening of strawberries in the fields about the town, and careful investigation of this point was made. Fifteen of the cases had eaten no strawberries whatever, five of the thirteen remaining could not remember having eaten them, but were not sure, seven cases had eaten strawberries coming from three different sources. This was early in the outbreak and no connection could be

traced between the strawberry pickers and the disease. In addition only a small proportion of the strawberries produced in the neighborhood were consumed there, the balance being shipped to the neighboring town of Harrisonburg where they were retailed and consumed. No cases of typhoid appeared in Harrisonburg during this time.

The only confectionery is located at the drug store kept by one of the physicians. Ice cream made in Harrisonburg, and shipped into the town was sold there, soda water being also dispensed. Only two of the cases were sure of having eaten ice cream or drunk soda water, four were doubtful, and twenty-one were positive that they had not consumed either.

CONTACTS. Multiple cases in single houses were common, but only two cases had been in positive contact with previous cases of the disease during the period of incubation. Ten cases had been remotely exposed to previous cases of the disease, such as visiting infected houses though not eating anything or drinking water, and in some cases not even going inside the gate.

The town is peculiar for Virginia in that it is almost free from colored population. Only three or four negroes live in the town itself and very few in the neighborhood. Only one negro is employed in domestic service in the town and there were no cases of the disease in the house in which she worked.

AGE DISTRIBUTION. The age distribution of the cases was remarkable. Thirteen, or 48% of the cases were under ten years; eight, or 30%, were between ten and twenty; while only six, or 22% were over twenty years. The proportion of cases under twenty, 78% is very suggestive.

Although the churches of the town are not supplied with wells, the church attendance of individual cases was recorded. The cases were uniformly scattered through the various denominations and churches of the neighborhood.

There had been no public gatherings of any kind, except one early in May—a lantern slide talk at which nothing was eaten or drunk, and at which about 60% of the cases were in attendance.

School closed three weeks prior to the beginning of the outbreak.

CONCLUSIONS. A careful study of the results summarized above leads to no definite conclusion as to the means of spread of the disease. It is unreasonable to suppose that all the springs, wells and cisterns could have been infected at approximately the same time. Water as means of dissemination in this case can, we think, be excluded. Evidence as to milk, shellfish, fresh vegetables, fruits, and other foods as carriers of the infection is negative. Flies as carriers of the infection have been constantly in mind, and the following factors must be considered. The first cases occurred at a time when flies were just becoming prevalent, and as far as is known when infectious material was not present in large amount in the town.

The town, of course, abounds in dry closets, most of which were in bad order, and were evidently neglected. As soon as the disease began to appear, however, the attention of the people was directed to this factor and steps were taken to remedy the condition. Rigid disinfection was insisted upon by the physicians in charge from the very first, and so far as could be learned by the writers, was well carried out. There was apparently, at no time in the village any considerable amount of infected excreta exposed to flies. The precautions regarding dry closets were kept up after the cases began to convalesce and were continued throughout the course of the epidemic. The evidence as to flies is in our opinion far from conclusive.

BACTERIOLOGICAL REPORT. A few agglutination tests were made with the serum of patients and a culture of B. typhosus. The bacteria did not agglutinate typically. In dilutions up to 1 : 50 a few small, loose clumps formed within two hours, but the main mass of bacteria remained free and motile.*

A comparative test was next set, using one serum against several different bacteria at the same time.† The hanging drop method was employed using a fresh, 18–24 hour living agar culture, suspended in normal salt solution. The result of this test is shown in table I:

* In a few specimens, which were allowed to stand over night, large, tight clumps, and motile Pfaundler's threads developed.

† We are indebted to the Director of the U. S. Hgyienic Laboratory for furnishing us cultures for this work.

TABLE I.

Case No.	Dilution of Serum	Suspension of Paratyphoid A	Of Paratyphoid B	Of Typhoid	Of Para Colon
4	1 : 10	0	*xxxx*	0	0
	1 : 50	0	*xxxx*	0	0
	1 : 100	0	*xxxx*	slight trace	0
	control	0	0	0	0

The reading gives the end reaction after two hours. In this experiment agglutination of paratyphoid B began promptly, and at the end of two hours was positive in a dilution of 1 : 100.

A series of serums were next tested simultaneously against typhoid and paratyphoid B. The first seven serums were tested by the hanging drop method, the remainder by the macroscopic method, using a dilution of 1 : 30, and noting the rapidity and completeness of the agglutination reaction.

TABLE II.

Name of Patient	Dilution of Serum	Agglutination with B. typhosus	Agglutination with B. paratyphosus B.
Case No. 6	1 : 10	0	*xxx* 40 min.
	1 : 50	0	*xx* 40 min.
	1 : 100	0	*x* 1 hour
Case No. 7	1 : 10	0	*x x* 1 hour
	1 : 50	0	*x* 1 hour
	1 : 100	0	trace 1 hour
Case No. 11	1 : 10	0	*x* 1 hour
	1 : 50	0	*xx* 1 hour
	1 : 100	0	*x* 1 hour
Case No. 16	1 : 10	0	*x* 1 hour
	1 : 50	0	*xx* 1 hour
	1 : 100	0	*xx* 1 hour
Case No. 12	1 : 50	Trace	*x* 1 hour
	1 : 100	Suggestive	*x* 1 hour
Case No. 20	1 : 50	Slight	*xx* 1 hour
	1 : 100	Trace	*x* 1 hour
Case No. 26 Serum taken during first few days of disease	1 : 50	Slightly suggestive	Suggestive
	1 : 100	Slightly suggestive	Suggestive
Case No. 1	1 : 30	0 ?	*xxxx* 1½ hour
Case No. 3	1 : 30	0 ?	*xxx* "
Case No. 9	1 : 30	0	*xxx* "
Case No. 13	1 : 30	trace	*xxx* "
Case No. 15	1 : 30	trace	*xxx* "
Case No.	1 : 30	0	*xx* "
Case No. 25	1 : 30	0	slight
Case No. 22	1 : 30	0	*xx* "
Case No. 27	1 : 30	0	*xxxx* "

From Tables I and II it is seen that of 17 cases tested, all except two, Nos. 25 and 26, reacted positively with paratyphoid B. The serum from No. 26 was obtained at an early stage of the disease. Out of eight cases tested quantitatively, six were definitely positive with paratyphoid in a dilution of 1:100. In several cases, marked "trace," "suggestive," "?" or 'slight," the patients serum produced small clumps in the typhoid culture, but left many free and active organisms. It is best to regard those results where the reaction is doubtful as negative. Case No. 26 may be discarded. This leaves 16 cases of which 15 reacted positively with the paratyphoid B bacillus, while none of them gave a clear, positive reaction with the typhoid bacillus.

As these cases came from different parts of the village of Weyers Cave, were of different ages, and occupation, and were attacked at different times, it seems reasonable to infer that the entire series of cases was caused by the same strain of bacterium.

In attempting to obtain a clue to indicate the presence of some carrier in this epidemic agglutination tests were made with the blood of 38 individual, mostly healthy members of households in which cases of fever had developed. Of these 38, five, (four adults and one adolescent), gave positive reactions with the paratyphoid B; the other thirty-three reactions were negative.

A month after the agglutination tests were made at Weyers Cave, but while cases were still continuing to appear at that point, a mild fever, resembling the disease at Weyers Cave, broke out in a household about six miles away, attacking five out of six of the family. Through the kindness of Dr. Whitemore the serum from these patients was examined and from another patient, living about ten miles from Weyers Cave, suffering with a severe, typical case of typhoid fever. The latter patient and two of the members of the above mentioned family reacted with the typhoid bacillus positively, and gave no agglutination with the paratyphoid B. The other members of the first mentioned household, in whom the disease was of recent development, gave no agglutination with either culture. This indicates that in the vicinity of Weyers Cave true typhoid were also occurring during last summer.

Several attempts were made to recover the paratyphoid B. bacillus from the stools of patients, chiefly by the use of Endo's medium, but without result.

Blood cultures were made from three patients. The first patient had had the fever for over a week, the others for only a few days. About ten c. c. m. of blood was divided among several agar and Endo-agar plates, and a part was put in broth and dextrose broth. The blood from the last case was mixed with sterile ox-bile, incubated, and attempts were made to cultivate the bacillus from the mixture. All of the blood cultures remained sterile.

After the failure to recover the offending organism by workers in the laboratory located in the town of Weyers Cave, efforts were made to isolate it by Mr. J. A. Waddill, Acting Bacteriologist of the Virginia State Department of Health, working in the branch laboratory in Staunton. Notwithstanding the fact that five or six cases, apparently favorable as to time, were carefully examined, using Endo's media, no organism resembling typhoid or paratyphoid could be isolated. It is important that at this time studies were also being made of the typhoid fever situation in Staunton, twelve miles from Weyers Cave. The typhoid bacillus was discovered without difficulty from the Staunton cases, using the same technique and same media as that used in the cases at Weyers Cave.

CONCLUSIONS.

The writers believe that there prevailed at Weyers Cave, Virginia, during the summer of 1909, an epidemic of a disease which was probably paratyphoid fever. We believe further that the epidemological studies failed to give any reasonable explanation as to the means of transmission of the disease.

We believe that this condiiton was peculiar to the epidemic in question as further studies in the same neighborhood disclosed the prevalence of a disease which was clinically and bacteriologically true typhoid fever.

The thanks of the writers are due to Drs. Sellers and Hoskins, of Weyers Cave, who had charge of the cases and who have reported the clinical aspects in a paper read before the meeting of the Medical Society of Virginia, and also to Mr. J. A. Waddill, whose work is reported above.

THE CONTROL OF TYPHOID FEVER IN THE CITY AND COUNTRY WITH A DESCRIPTION OF A MODIFIED HESSE'S MEDIUM FOR THE DETECTION OF THE TYPHOID BACILLUS IN EXCRETA AND FLUID FOODS.*

By WILLIAM ROYAL STOKES, M. D., and FRANK W. HACHTEL, M. D., Baltimore, Md.

ABSTRACT.

Before describing the various methods for the control of the spread of typhoid fever and the assistance rendered to these methods by means of a modified Hesse's medium, we shall first describe the manufacture of this medium and its uses and limitations in the detection of the typhoid bacillus. Jackson has described the various media used for the detection of the typhoid bacillus, but as Hesse's semi-fluid medium is the best method we shall simply describe this medium, adding our own modifications.

The formula of the medium is as follows:

Agar (absolutely dry),	4.5	grammes (dried at 105° C. for half an hour.)
Liebig's ext. beef,	5	grammes.
Peptone (Witte),	10	grammes.
Salt,	8.5	grammes.
Distilled water,	1000	cc.

Before using, the agar should be dried at 105 degrees C. for half an hour to free it from all moisture. This medium should be kept in an ice chest, the air of which is saturated with moisture.

The agar is dissolved in 500 cc. of water by heating and the loss by evaporation made up. The peptone, beef extract and salt are dissolved in another vessel containing 500 cc. of distilled water, and the loss of weight by evaporation is made up by the addition of distilled water. The two solutions are then mixed and boiled for thirty minutes, the loss of weight being made up

* From the Bacteriological Laboratory of the State and City Board of Health, Baltimore, Md. Read at the meeting of the American Public Health Association at Richmond, October, 1909.

by the further addition of distilled water. It is next filtered, the reaction corrected to the neutral point and tubed, nine cubic centimeters being placed in each test tube. It is then autoclaved at 15 lbs. pressure for twenty minutes and stored in the ice box.

METHOD OF DILUTION EMPLOYED.

1 gramme feces.
1 cc. urine or of a bile culture of urine, feces, milk or water is added to 9 cc. of sterile water.

From tube No. 1, 1 cc. is poured in a plate, a second cc. is inoculated into tube or water-blank No. 2. From Tube No. 2, 1 cc. is poured into plate No. 2, and 1 cc. is placed in test tube No. 3, and this is continued through eight water-blanks and plates.

Upon plates in which the colonies are few in number, the typhoid bacillus presents a characteristic appearance. On such plates the colonies are much larger than those of the B. coli, having an opaque nucleus surrounded by a translucent area, beyond which is a circular white edge which presents a concentric arrangement. The colon bacillus, on the other hand, occurs as a white colony seldom larger than the head of a pin.

Hesse has isolated the typhoid bacillus from stools and urine, while Jackson has obtained it from artificially infected milk, from the Hudson River and small water supplies. These concentric colonies, however, sometimes turn out to be B. paratyphosus, B. fluorescens, B. fluorescens liquefaciens, and other motile water organisms. In using this medium for stools, urine, bile cultures, and water, we often met with the same difficulty, the Bacillus alcaligenes often exactly resembling the typhoid colonies. One of us had noted that the typhoid bacillus will readily acidulate ordinary nutrient agar to which one per cent lactose and five per cent of glycerin had been added. Upon adding these constituents to Hesse's semi-fluid medium, we found the colonies of the typhoid bacillus and the para-typhoid bacillus will produce typical pink colonies if azolitmin is added to the medium. We also found that we must add 6 grammes of agar as the glycerin makes the medium more fluid.

In plating out stools and urine the above mentioned organisms are pink, whilst the colonies of Bacillus alcaligenes form a

typical blue concentric growth. Other motile organisms such as Bacillus proteus, Bacillus fluorescens, Bacillus fluorescens liquefaciens and the Bacillus pyocyaneus are almost always alkaline, and the colonies are therefore blue. The paratyphoid bacillus forms a red colony with a concentric zone which can only be distinguished from the typhoid bacillus by picking a colony and mixing it in a little bouillon and testing it for agglutination with the typhoid immune serum furnished by Parke, Davis & Co., which will agglutinate the typhoid bacillus at a dilution of 1 to 100,000. These colonies are then subjected to the ordinary cultural tests for the typhoid bacillus or for the paratyphoid bacillus, if they agglutinate with immune serum made from these organisms.

THE ISOLATION OF TYPHOID BACILLUS FROM DRINKING WATER.

We have been successful so far in isolating organisms typical of the typhoid bacillus from one of the impounding reservoirs in our water supply and from one of the streams emptying into an impounding reservoir. Two hundred cubic centimeters of water were centrifugalized and the sediment was inoculated into lactose bile in a fermentation tube. At the end of twenty-four hours a series of dilutions was made in this modified Hesse's medium and incubated at 37 degrees C. for twenty-four hours. At the end of this time a number of typical large concentric pink colonies appeared in the litmus glycerin lactose semi-fluid agar, and pure cultures were made on slant agar tubes. Several of these organisms corresponded culturally to the typhoid bacillus, and one from each source was virulent for animals, causing purulent peritonitis and general bacteremia with death in twenty-four hours. Upon making agglutination tests with known typhoid blood these organisms would at times give typical agglutinations but at other times they would not agglutinate with such blood. It should also be noted that none of these organisms isolated from water will agglutinate at a dilution of 1 to 1000 with a strong Parke, Davis immune serum, which will agglutinate a typhoid bacillus obtained from the blood of typhoid fever in a dilution of 1 to 100,000. We also obtained a typhoid bacillus from a stream laden with sewage which passes through Baltimore. This organism agglutinated with immune

serum in fairly high dilutions and gave the other tests mentioned above. We also obtained the typhoid bacillus from a well which supplied a large boarding school with water in one of the counties of Maryland. A large number of cases of typhoid fever developed among the boarders, but the day scholars entirely escaped. Upon investigation it was found that the day scholars drank water from a different source and only the boarders used water from this well. The typhoid bacillus produced the characteristic colonies on our modified Hesse's medium, agglutinated with typhoid blood and immune serum, was pathogenic for animals and produced all of the cultural reactions of the typhoid bacillus. Immune serum made in the rabbit by injections of this organism was also agglutinative for typhoid bacilli obtained from cases of typhoid fever.

CARRIER CASES.

We have used our modified medium in order to detect carrier cases and recite the following example as a successful test: A colored boy began waiting on the table at the country place of his employer and two weeks later the wife of his employer developed typhoid fever. At the same time he began waiting on the table at his own house and three weeks after this his sister was attacked with typhoid fever. He had never handled raw food previously nor waited on the table. An examination of his stools and urine showed the presence of many typical red colonies which later proved to be typhoid bacilli agglutinating with high dilutions of the typhoid immune serum.

INSTITUTIONAL TYPHOID.

We have studied two outbreaks of typhoid fever and have been able to locate the carrier cases by means of the modified medium and thus stop the epidemic.

The first outbreak occurred in a home for young women containing fifty inmates and three servants and in about eight months about fourteen cases of typhoid fever had developed among the inmates. All other causes of typhoid fever were excluded as the water was boiled, the milk pasteurized and the vegetables carefully washed in boiled water. Cultures from the stools and urine were taken from every inmate of the house including the domestics and in the specimen made from the

stool of the cook, who had entered the institution about two months previously, the typhoid bacillus was found in large numbers on several different occasions. This woman handled the bread and all raw foods except milk, and upon being removed from the institution the epidemic ceased.

The second outbreak occurred in a Convent and Home for Colored Children, containing eighty-eight inmates in all. All other causes of typhoid fever were excluded and upon making an investigation we found that the eight cases which had developed could be divided into two groups of four each. Two of the sisters handled the milk and other raw foods which were used by the other sisters in the institution. The typhoid bacilli were detected in the stools of both of these sisters and four other sisters had developed typhoid fever, having received infected food from these persons.

The second group consisted of cases of paratyphoid infection confirmed by the agglutinative reaction for the paratyphoid bacillus and its isolation from the stools. These cases were all among the colored children, and upon investigation the paratyphoid bacillus was isolated from the urine of one these sisters who handled their food and from the stools and urine of another sister who was thrown more or less in contact with these children in a separate part of the building.

In conclusion we believe that this modified medium by means of the color reaction which it shows for the typhoid and the paratyphoid bacillus will prove useful in detecting this organism in water, milk, stools, urine and other similar materials.

THE MANAGEMENT OF MILK BORNE OUTBREAKS OF TYPHOID FEVER.*

By Dr. CHARLES V. CHAPIN,
Health Officer, Providence, R. I.

Last autumn an outbreak of typhoid fever in Providence, confined to the customers of a certain dairy, led to the careful consideration of several points of interest in such outbreaks, and induced me to write to a number of men interested in epidemiological matters, asking for an expression of their opinion. Answers were received from nearly all, and this paper is a consideration of the subjects discussed.

In the first place it seems to me that the only evidence on which it can be reasonably assumed that a given milk supply is the cause of typhoid fever, is an excess of cases among the persons supplied, provided, of course, that no other possible connection between the cases can be found. From this opinion, however, several of my correspondents vehemently dissented, but I cannot help thinking that there must be a certain percentage of cases on a milk supply which, if exceeded, renders it fairly certain that the supply is infected. This percentage depends primarily upon the total amount of typhoid fever in the community. If there is an excess of typhoid fever upon a milk supply over and above the limits determined by the law of error, then we may reasonably assume that the milk is the source of the disease. The percentage of cases must be larger in a city where there is much typhoid fever than in one where there is little, and according to the law of error it must be larger for a small supply than for a large one, and larger if the supply is confined to a limited area than if it includes a large part of the city. In a very small supply, as where one or two customers only, receive the milk, the number of cases infected would be of no value, but for ordinary milk routes, in ordinary cities, it would certainly be possible to work out mathematically the percentage of cases which if exceeded would indicate with a fair

* Read at the Richmond meeting of the American Public Health Association, October, 1909.

degree of certainty that the milk is at fault. I am not competent to work out this problem, and evidently my correspondents have not done so, for those who think as I do, that the percentage of cases is an all important point, give as the danger limit all the way from 0.1 to 5 per cent.

There is another way of approaching this problem and that is by the study of the cases which actually do occur on milk routes and noting how large a number develop on a single route in a given time, say a week, without the development of an outbreak. An examination of the milk cards in Providence shows that out of about 600 dealers, 155 have had one or more cases of typhoid fever among their customers during the last four years. Only nine of these have had more than two cases on their route within a week. Investigation promptly showed in three instances that the cases were due to personal contact between the families. In the other six instances an unmistakable milk-borne outbreak developed. It is desirable that the milk cards in other cities be examined in the same way.

It was assumed in my first query that when it appears that an outbreak is due to infected milk, the incriminated supply should be at once stopped by the local health officials. But Pease called attention to what seems to be the fact, that in a large majority of reported outbreaks, the infection of the milk ceases before the order of the board of health goes forth. The outbreak declines and the board of health gets the credit, but the milk becomes free from infection before the order is issued, and perhaps before the investigation is made. As the average incubation period of typhoid fever is probably two weeks, it is fair to conclude that some unknown cause checks the outbreak if its crest is earlier than two weeks after the stopping of the supply. I have recently studied some sixteen outbreaks, and in all but two the distribution of the cases in point of time suggests that the infection was not continuous, but affected only a single distribution of the milk. Usually the outbreak extends over about a month, though by far the larger number of cases are more closely bunched, giving the curve of distribution quite a sharp apex. The early and late straggling cases suggest unusually short, and unusually long periods of incubation. I shall be very glad to have my attention called to outbreaks

in which it is definitely determined that there is only a single infection of the milk, so that the curves of such outbreaks may serve as a standard for comparison. When the outbreak is due to contaminated water getting into the milk, it is not unlikely that often the milk may be continuously infected for some time. Such perhaps was the case in Springfield, in the outbreak studied by Sedgwick in 1892. But usually milk is infected directly by handling by persons who have the disease or are carrying the bacilli. Such infection is dependent on chance which is much against the infection, so that theoretically we should not expect a sick person or carrier to infect the milk continuously, and as a matter of fact carriers as shown by Davies, Greig and others, do cause infection only in a very irregular and intermittent manner.

It is a very difficult problem which often confronts health officers when the evidence begins to point strongly to a given milk supply as the source of a typhoid fever outbreak. We may admit for the moment that in a few days the evidence will probably become conclusive, and that in most instances careful search will discover the real source of the trouble, but there is often if not usually, a few days during which the search is being made, and in which it appears to the health officer that the milk is probably infected, though he cannot for the time being put his finger on the point of infection. Frequently the public are aware of the facts, and owing partly to the undue emphasis which has of late been laid upon milk infection, are greatly alarmed, and owing to the usual complacent claims made by health officers as to their efficiency in stamping out such outbreaks, the press is likely to hold the sanitary authority strictly accountable for all cases subsequently occurring, unless active measures are taken. What must the health officer do. He may:

First. Do nothing at all until the real source of the trouble is discovered. This is the course recommended by a number of men whose opinion is of much value. It scarcely seems wise, if anything is to be done at all, to delay doing it at once as soon as it becomes fairly certain that the outbreak is due to the milk. Certainly such delay is fraught with danger to the health officer, and is scarcely justifiable on scientific grounds, for it will be

admitted that many outbreaks are traced to milk with a high degree of certainty, several days before the source of the milk infection is discovered, also that in some outbreaks the real source is never discovered, and I suspect that in some others the findings of the health officer are based on pretty weak evidence.

Some of the correspondents insist that in such cases the actual source of the infection must be discovered before any action is taken. Others think the supply should not be stopped when the source of infection is unknown, unless the evidence is very strong indeed, that is the number of cases much larger than our mathematical formula demands. One writer would stop the supply until the dealer finds and removes the source of infection, thus putting the burden of proof on him. Most gave rather evasive and indefinite answers as to what should be done under such circumstances. If the supply is stopped it is necessary to see that it does not go elsewhere, usually not a difficult matter owing to the publicity given by the press. If the milk is pasteurized it may be used for butter making; otherwise not, for though there is little evidence of butter borne typhoid fever, there is a possibility of it, and this restriction is not a burdensome one.

SECOND. The dealer may be compelled or permitted to pasteurize his supply, or perhaps the city might do it for him. Kober, Trask and Hill advise this course. There are, however, practical difficulties. No city as yet has a pasteurizing plant as recommended by Trask, and it would be difficult for a dealer to arrange for pasteurization at short notice. Pasteurization would have to be done under the direct supervision of the health officer, or it might not be done properly, and at present most health officers are not familiar with the process. The chief objection is that the customers would probably at once notice a change in the milk, especially if the outbreak was being discussed in the newspapers, and would stop their purchases. Dealers with whom I have talked vehemently oppose pasteurization unless they are already doing it. Again if the man who handles the milk on the delivery wagon is the source of the infection, pasteurization would be an injury rather than a benefit. Others as Slack and Trask, advise that if the source be not found, the business might continue if the methods used in producing and handling certified milk are adopted.

THIRD. The health officer might notify the public as to the probability of the infection of the milk, and advise them not to use it uncooked. This is theoretically the most scientific way to manage the outbreak, but its apparent lack of definiteness would not suit the public (a matter however of minor importance) and it is highly probable that it would injure the dealer's business almost, if not quite as much as officially suspending it.

FOURTH. The health officer may stop the dealers business and prevent the producers from sending in the milk through other channels. If authority to do this is not specifically given by statute, the published advice of the health officer that this should be done is probably sufficient. At present this seems to be the most practicable way of treating the problem. It is perfectly logical for the municipality to pay for the milk during the time that the supply is under investigation, but not after it has been determined that the dealer or his producers are at fault.

After it has been determined that there are persons sick or infected with typhoid fever in the family of a dealer, producer or their employees, what then is to be done?

A number of my correspondents insist on the removal of the infected person from the premises, but the majority think that strict isolation of the case is permissible. When we consider how often typhoid fever attacks nurses in hospitals, and how often it extends from one to another in private families, it seems unwise to allow persons who handle milk to live in the same house with a case of typhoid fever, or indeed any other contagious disease. The removal of the patient to a hospital can usually be accomplished without any great hardship, and when it cannot, the handlers of the milk can often be readily removed from the house. Public opinion will, I am sure, support this requirement, which is not usually a very onerous one. Utensils and everything used in the business should be sterilized.

The most difficult question is that of dealing with the well members of the infected families, the contacts. Most of my correspondents make no mention of the rest of the family, and presumably would ignore the danger of infection from them, a view in which I am inclined to concur. Trask, Goler, Winslow and Wheaton would make a search for carriers. Trask in his first letter advised that the feces and urine of all persons engaged

in the business should be examined bacteriologically, and their blood also should be examined by the Widal test, and if any give a history of typhoid fever, the excreta should be examined twice. In a subsequent letter he says that he does not believe that these stringent measures could be adopted successfully in the average community. There are certainly grave difficulties in the way of this procedure, not the least of which is the natural repugnance of most persons to submitting to the test. There are also technical difficulties in getting specimens, and the still greater difficulty in having the specimens properly authenticated. Moreover, as in most biological work of this kind a single negative result means little, and in the case of chronic carriers, whose elimination of bacteria is notoriously intermittent, several negative results would be far from conclusive. Again the popular objection to the search for carriers, and distrust of bacteriological methods, is sure to increase, as it becomes known that carriers when found, are likely to be permanently excluded from business.

Chalmers, Hill, Wheaton, Woodward and Scott advise the daily medical supervision of all persons in the infected family for a period of three weeks.

Kober, and, if I understand him correctly, Trask, would permit the continued sale of the milk without other precautions, provided it were pasteurized. Most officials, however, would stop the sale of milk unless the infected persons were removed or strictly isolated. None of my correspondents advocates the purchase and destruction of the milk by the municipality though this has been done. There seems to be no justification for it. Milk will not become infected with typhoid fever, scarlet fever or diphtheria, unless the handlers of it neglect the simplest rules of personal cleanliness. Dealers and producers have all been told this time and again, but they scoff at the suggestion of handwashing as foolish fussiness. It costs something to produce milk with a low bacterial count, but the prevention of specific infection by practicing ordinary cleanliness is not burdensome. Those who neglect to take precautions, as proved by the infection of their milk, should suffer the consequences.

Another question of very great practical importance is how long shall restrictions be enforced when typhoid fever is found among milk dealers or producers. I am sorry to say that most

of my correspondents evaded this question, though it is one to which every health officer is likely to be called upon to give a very definite answer. Abbott, Dixon, Trask, Woodward and Winslow advise that isolation be maintained, or other restrictive measures enforced until the patient is shown to be no longer a distributor of bacilli. To determine this, the feces and urine should be subjected to bacteriological examination, and Trask recommends that three examinations be made, a week apart. To apply these tests to the patient is doubtless easier, than it would be to apply them to all the contacts, but unless the patient is in a hospital, there might be some trouble in getting authentic samples. As it would probably be entirely impossible to apply such a test to the other members of the family, or to other handlers of the milk, and as at best it would be difficult if not impossible to apply it to the patient, and as even three negative examinations are not conclusive, it does not seem to me that this test at present should become a routine measure. It might perhaps be offered occasionally as an alternative to a long time limit, in which case the patient might be expected to see the necessity of co-operating with the health officer in the application of the test.

Several correspondents are decidedly opposed to fixing an arbitrary time limit for isolation in these cases, but Hill, Levy, Pease and Scott, perhaps rather grudgingly, admit that this may be the most practical method of dealing with the subject. Hill and Scott suggest six months and Pease three months. It appears to the writer that the evidence is that in the great majority of cases the patients are free from infection by the end of the third month after taking to bed, so that this is a fair working time to set for the period of isolation. It must be remembered that we have decided at present that it is impracticable to search for carriers among the contacts, and hence there is little wisdom in being over careful about letting the patient return to work, if by a moderate time limit we can avoid from 90 to 95 per cent. of the danger. Pease further suggests that in all these instances of milk infection, it would be wise to require as a condition of the resumption of business, the application of all the rules for the production of certified milk, and Kober urges pasteurization.

When typhoid fever is traced to a milk supply and no sickness is found among those engaged in handling the milk, but investigation reveals that a chronic carrier is the source of the trouble, the majority of the correspondents agree that the carrier must be permanently debarred from coming in contact with the milk in any possible way. A few demand that the carrier be removed from the premises, and this certainly would be the safer way. If such a person does remain on the premises it can never be certain that in some way the milk may not be contaminated, or some other person in the family, or among the employees, contract the disease, and if this occurred the health officer would be severely blamed. On the other hand, sometimes, as when the carrier is a dealer or farmer who has considerable money invested in his business, to compel him to give up all active interest in his business, is a very serious matter, and it is doubtful whether such a procedure would be sustained by the courts, or whether statutory provision for such action would be enacted by any legislature. Hill and Kober suggest pasteurization, and perhaps removal of the carrier from the premises or pasteurization, should be presented as alternatives.

In certain instances a milk supply will be implicated with almost a certainty, and yet the exact source of the infection may never be determined. If under such circumstances the supply is stopped, or the milk pasteurized, how long must these restrictions continue? According to some, these precautions must be continued indefinitely, but most of the correspondents showed no disposition to give a definite answer to the question. As such an unknown source of infection is as likely to be a mild missed case, as a carrier, much can be said in favor of adopting an arbitrary time limit as is recommended for cases of actual sickness. This might be three months, or perhaps less, or might be presented as an alternative to a hearty co-operation in a diligent search for carriers.

It will be noticed that in this discussion the writer has not urged a rigid search for infection by bacteriological methods. Without such a search it is impossible to locate all sources of infection. To attempt to control some of the sources of infection, even though they are the most numerous, and to ignore others, is of course illogical and inconsistent. But the manage-

ment of our common contagious diseases is and must be for the present, frequently inconsistent and illogical from a scientific view-point. We must carefully estimate the difficulties in the way of proposed action, consider the opposition to be aroused, the burden to be imposed on the individual or the public, the cost to the community, and what is particularly important, the results likely to be obtained. In view of all these considerations the following tentative suggestions of what should be done for the control of outbreaks of milk borne typhoid fever are presented for discussion.

1. Assuming a typhoid death rate not exceeding the average of American registration cities, the occurrence of two or three cases of the disease on a milk supply for from 100 to 1000 families, within a week, requires a careful investigation.

If the cases increase to 5 or 6 on a supply of, or less than, 100 families, or 5 to 2 per cent. of 100 to 500 families, or 2 to 1 percent. of 500 to 1000 families, and perhaps less than that on very large supplies, and no other connection between, or local cause for the cases, can be found, it is reasonably certain that the milk supply is at fault.

2. When a milk supply is found to be infected and the source is not determined it should be shut off or pasteurized. It is desirable to examine for typhoid bacilli all persons engaged in handling the milk but it is not feasible at present to adopt this as a routine measure.

3. When typhoid fever is found among those who produce or handle milk, the patient should be removed from all contact with the milk, and from all contact with those who handle the milk. There should also, of course, be sterilization of vessels, and observation of all exposed persons. Bacteriological search for infected persons is not feasible as a routine measure.

4. If a chronic carrier should chance to be found, such must be removed from the premises where the milk is produced or handled, and must not live with those who handle the milk.

5. When a milk supply is infected, the precautionary measures must be carried out for three months from the beginning of the last case among the milk handlers, except in the case of proved carriers, when they must become permanent.

DISCUSSION.

Dr. LUMSDEN. The literature on the epidemiology of typhoid fever heretofore has contained too many conclusions and too few carefully collected facts. It has been assumed on what appears to me to be rather insufficient evidence that Para-typhoid infection is conveyed by the same media that convey typhoid infection. We have some evidence to show that Para-typhoid infection is conveyed in some instances in the same way as is typhoid infection, but there may be some means by which Para-typhoid infection is conveyed which are different from those by which typhoid infection is conveyed. This possibility I think, makes it advisable to have cases of Para-typhoid recognized. There is a tendency on the part of some of our distinguished clinicians and bacteriologists in American to classify the whole group of fevers caused by typhoid and Para-typhoid bacilli as typhoid fever. I think such a generalization is unfortunate, and we should endeavor at every possible opportunity to have cases of Para-typhoid correctly diagnosed. In this way the facts collected in investigation of outbreaks may enable us to determine the means by which Para-typhoid is conveyed.

I was very much instructed by Dr. Chapin's paper on the Control of Milk Borne Epidemics of Typhoid.* In Washington we have found milk to be one of the important factors in the spread of typhoid infection. In the three years in which we have investigated the situation there we have had altogether five outbreaks definitely traced to milk infection. One of these outbreaks we traced to a bacillus carrier working on one of the farms and from which the implicated supply was obtained. This woman had typhoid eighteen years before, and since then had been apparently in excellent health. The faeces of this woman were shown by bacteriologic examination to contain a large number of typhoid bacilli. Fifty-four cases occurred in the outbreak. The last case developed twelve days after the woman had been recognized as a carrier, and the milk supply shut off from that farm. The outbreak occurred among the customers of two different dairymen, the cases occurring synchronously along the two milk routes. This confused us at the beginning of the outbreak. Upon investigation, however, we found that there was one farm which supplied both of the dairymen with a

* See page 29.

part of their milk supply. We directed our attention to that farm. A thorough investigation was made of the conditions on the farm and its surroundings but no history of any case of recent illness could be ascertained to account for the infection. We then thought of a bacillus carrier as possibly being the source of the infection and our investigations determined such to be the case.

This outbreak, I think, emphasizes the importance of keeping bacillus-carriers in mind when searching for the source of infection in milk-borne outbreaks of typhoid and, also, when considering measures to prevent typhoid infection from being introduced into milk supplies.

Dr. WOODWARD. There is one practical difficulty with respect to the management of milk outbreaks that I believe Dr. Chapin has not fully realized. Dr. Chapin says that when we discover a milk outbreak of typhoid fever and cause the dealer to discontinue the distribution of his milk, it is an easy matter to see that that milk does not reach the consumer through other channels. I think, however, that that is far from being the case. It may be the case when we are dealing with a single producer, but when we are dealing with a large retailer, a man handling milk from possible a dozen or, it may be, a hundred farms, the situation is very different. While in a case of that kind we might be justified in shutting off the milk of the retailer, yet we would ordinarily not have any definite ground for shutting off the milk of any particular producer. I cannot see the exact logic of Dr. Chapin's position, when he agrees with Dr. Pease, and I will say I also agree with Dr. Pease, that in most cases the infection of the milk has ceased before we discover the outbreak, and yet he at the same time would have us, as I understand him, forbid the sale of the milk without waiting to locate the focus of infection. In other words, the cause ordinarily ceases to operate before we know the outbreak is occurring, and yet notwithstanding this fact, Dr. Chapin, if I understand his paper, would have us forbid the sale of the milk without waiting to learn whether it has or has not done so. My own policy has been to wait until we can see something definite on which to act and then to deal with that particular focus. Very generally we have been able to do that. We have been able by a preponderance of the evidence to locate the infection except in some few cases. In a recent

case we had seven or eight cases which to a practical certainty we determined came from one farm. The outbreak discontinued, however, without interference by the Health Officer and the source of the infection was not determined. The date of onset of the latest case indicated that infection of the milk had ceased before the outbreak was discovered.

Dr. TORRALBAS. We have had no epidemic of typhoid fever in Cuba for quite a number of years. We only had a little outbreak of it, and through investigation we found the cause in the cultivation of the garbage in the plantations, brought in by Chinamen. The Chinamen use this as fertilizer, contaminated purposely, I am sorry to say, with the excreta of animals, and also fermentative organic matter. These cases appeared about four or five years ago I think, and since that time we have had no other epidemic of typhoid fever.

In regard to the other means of transmission of typhoid fever, the water supply, I am pleased to say that our water supply has not been infected since its establishment. It is spring water, and very seldom filtered by the poor of Havana, and yet we haven't any typhoid fever.

Dr. HURTY. I was very much interested in what was said this morning by the Superintendent of Health from Cuba. He related how he was confident that the boiling of milk in Cuba had had an effect no reducing the death rate. I heard Dr. John Guitaras talk upon the same subject in June of this year at Atlantic City, and was much impressed. Now is it not possible that the boiling of the milk in Cuba also settles this very problem? It destroys the bacilli, and the poisons also that might be formed in the milk to a large degree. We read in mythology when Prometheus brought fire down from heaven that he gave man sovereignty over the earth, and if we had better cooked our food for the many centuries past, we would have a better civilization than we now have. We would have strength and longevity and freedom from disease that we have not now, and if we would thoroughly cook all animal foods this problem would be pretty well settled. I have long since reached the conclusion that I will have no raw milk in my house and I do not have it. I think it is excellent, wise, rational, practical and businesslike to cook milk as well as other foods.

Dr. HILL. The autumn curve which Dr. Stokes' diagram showed has been explained in another way, i. e., as largely the result of returned summer vacationists coming in from the outside.

The handling of milk outbreaks when they occur is a matter of great interest. I think that Dr. Chapin is misquoting me when he says that I advised municipal pasteurization in every case of milk typhoid. It would be useless to advise pasteurization in many instances in small country towns where there are no public facilities at all for conducting it. The best way to handle a suspected milk epidemic at the very outset and before any definite evidence of the specific mode of infection has been found, I think, is to give the consumers orders to boil milk until you are perfectly certain that the milk supply is or is not infected. If it is infected then proceed to stop the milk supply until the particular infection can be found and removed.

Prof. WINSLOW. Professor Sedgwick and I published a paper on autumnal typhoid ten or twelve years ago, in which we said that we thought the reason for it was because the typhoid germ lived longer in the environment in hot weather. Then there was nothing said about the fly theory, and I think it is undoubtedly a factor in the transmission of the bacillus in the fall. We all tend to generalize from one or two things. There was a book published a year or two ago by Dr. Roberts, on enteric fever in India, which opened my eyes. He showed that among the English troops in India the typhoid occurred in the hot weather, and among the native troops it occurred the other way round. It seems to me that points pretty clearly to difference in vital resistance, as explaining in part the fact that white men who live in an ordinary temperate climate are more apt to get typhoid fever in hot weather. The spread of the germ, the vehicle of transmission and the vital resistance of the host are all factors. I do not think we shall ever get to the bottom of this question, or the tuberculosis question, until the matter of cooking milk is more fully emphasized, not merely on typhoid routes, but everywhere. Of course, there are occasional children who cannot digest pasteurized milk but they are rare. I do not believe that you gentlemen who are practical Health Officers will ever succeed in this fight completely until you preach and teach vigorously that raw milk is not a safe food. I am not

speaking of commercial pasteurization, but I do think it is a cardinal point to insist on the home cooking of the milk before it is used.

Dr. PEASE. I have in mind an outbreak of typhoid fever in which one-half of the cases were upon the routes of one dairy, but upon careful investigation of the amount of milk distributed by that one dealer we found that exactly one-half of the milk of the city was distributed by him, and that he had only the proportion of cases that he ought to have had, and yet some very good men jumped to the conclusion that the milk supply must have been the cause of the outbreak. A thorough statistical study of the situation was made, but was only possible because this health officer carried out his work in an ideal manner. He knew exactly how much milk each dealer was distributing and exactly from which farms or dairies it came, and thus having the records right at his finger tips, we were able on entering upon the investigations to make a thorough study almost immediately. We found that fifty per cent. of the cases were equally distributed among the other dealers. Taking all the evidence into account we were not long in coming to another conclusion, which was afterwards corroborated, namely, that the water supply was the cause of the outbreak. This illustrated the necessity for taking all factors into consideration, and making a complete investigation before drawing conclusions.

I think we could go on discussing this question of the autumnal rise in typhoid fever during the entire time allotted for our meeting. There is one fact, however, which speaks against Professor Winslow's statement regarding the variation in human vital resistance, according to the season of the year, as a factor in summer typhoid. I think it is a fact that in the cities now enjoying efficient water filtration, but which had high typhoid death rates due to polluted water prior to filtration, the summer typhoid rate was not much greater prior to filtration than at present. I know this to have been the case in Albany, New York. If now, vital resistance is a large factor in the incidence of Summer typhoid we would certainly expect a decline in the rate, when the opportunities for infection by water were practically eliminated. Personally I doubt the part of polluted water in the production of summer typhoid, unless the period from pollution to consumption of the water is very short.

THE RELATION OF TYPHOID FEVER AND THE WATER SUPPLIES OF ILLINOIS.*

By EDWARD BARTOW.

The work of the Lake Michigan Water Commission emphasized the fact that the typhoid fever death rate in the city of Chicago was much less than the typhoid fever death rate in the lake cities of northern Indiana. Lake Michigan is the source of the water supply for all of these cities. The water intakes of the Indiana cities are nearer the shore and are more affected by the Calumet River which pours into the lake the untreated sewage from a population of 500,000 people. The city of Chicago has, therefore, a much better water supply. The typhoid fever death rate in Chicago has decreased from 170 per 100,000 to between fifteen and sixteen per 100,000. The high rate was before the water intakes were extended farther into the lake and before the diversion of the city's sewage through the drainage canal into the Illinois River.

Because there are large cities having good water supplies which have a typhoid fever death rate lower than that of the city of Chicago and because we learned that the typhoid fever death rate of the city of Rockford, Illinois was only 7 or 8 per 100,000, it occurred to us that it would be of interest to compare the typhoid fever death rate of the city of Chicago with the rest of the state with a view to determining whether the outlying districts had a serious effect on the health of Chicago and also to learn if possible what relation existed between the typhoid fever death rate and the water supply.

The only published statistics available were the statistics for 1907 in the bulletin of the State Board of Health†. From the data there given the typhoid fever death rate per 100,000 for each county was calculated. The results of this work were so suggestive that it seemed worth while to carry the matter further. Through the courtesy of Dr. J. A. Egan, Secretary, and Mr. William J. Hoyt, Registrar of Vital Statistics of the Illinois State Board of Health the unpublished statistics of the

* Read before the American Public Health Association at Richmond, October, 1909.
† Monthly Bulletin State Board of Health of Illinois, February, 1908.

typhoid fever death rate for the years 1904, 1905, 1906 and 1908 were obtained. Using the estimated population for each year as calculated by Mr. Hoyt as a basis the rate per 100,000 for each county for each year and the average for the five years were calculated.

A study of the data shows that it is not possible to draw any definite conclusion from the rate during any one year. In Putnam county for example, the rate was 75 per 100,000 in 1904. There were no deaths in any other year. Putnam County is a small county so that a typhoid fever death rate of 75 per 100,000 was obtained from three deaths in a population of 4,000. The average for five years was 15. An epidemic at Streator in 1907 due to an infected water supply raised the rate in that year to nearly 30 per 100,000. In the other four years the rate was so low that the general average is below 20. The statistics for the whole state show considerable variation in the death rate from year to year. This is undoubtedly due to epidemics.

The average rate in each county for the five years is shown on the map. It is readily seen that the highest typhoid fever rate has been in the southern part of the state. We find only one of the southern half of the counties with an average rate of less than 10 per 100,000. This county, Douglas, is on the line between the two sections and as will be shown later is in an area of low typhoid fever. Only 2 other counties, Scott and Macoupin, have a rate below 15. In the northern half of the counties there are 13 with a rate below 10 and 10 more with a rate below 15. In the southern part also there are 8 counties with a rate above 40, and 12 more with a rate above 30; whereas, in the northern part of the state there is only 1 with a rate above 40, and 1 other having a rate above 30. That this record is dependent somewhat on the water supplies of the state can be seen by comparing this map with a map showing the distribution and character of the water supplies of the state. In the northern third of the state or better north of a line from Quincy to Lake Michigan the greater part of the water supplies are drawn from deep wells in rock. In this section there are only 3 counties with a rate above 25 and below 30, and 3 more with a rate above 20 and there are 10 with a rate below 10 per 100,000. In the middle portion of the state or rather in the east central portion of the state we find

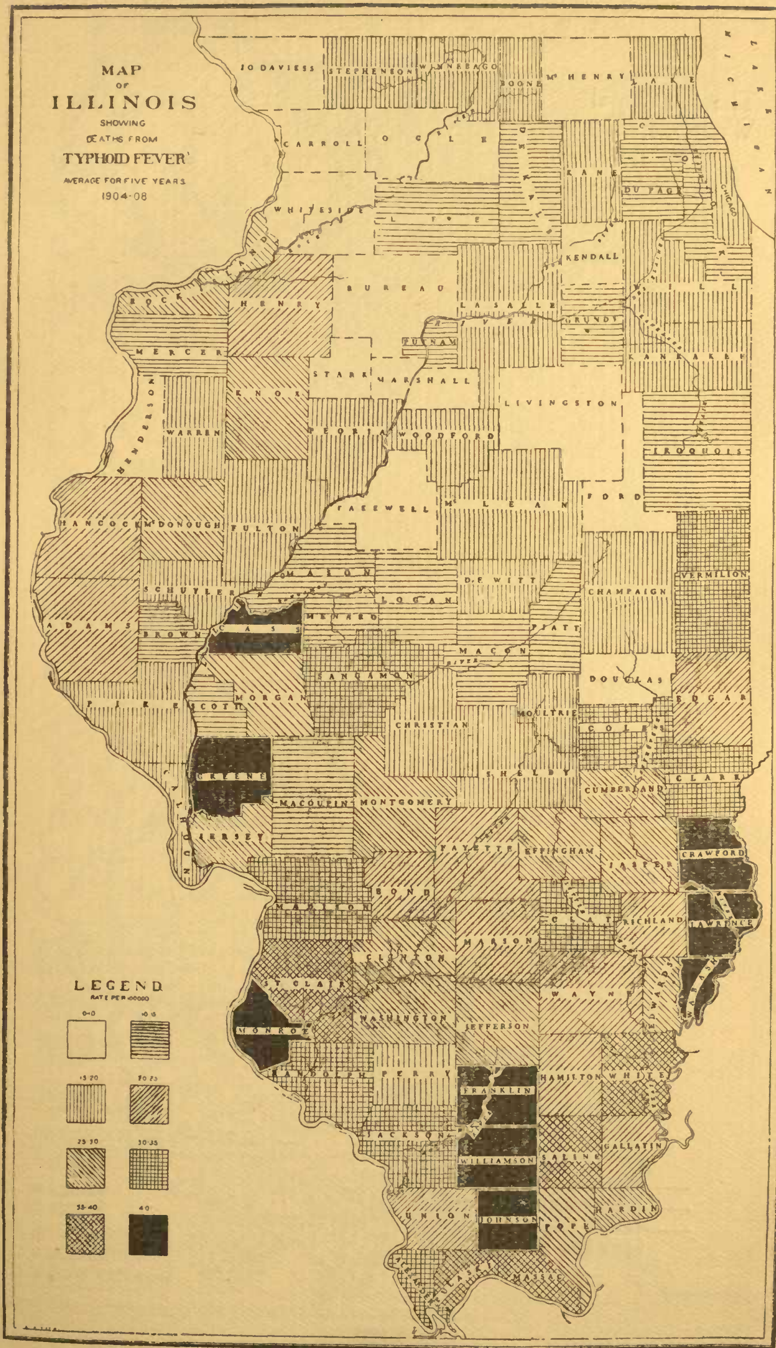
an area of glacial drift of 100 feet or more in depth. This drift covers with slight exceptions that portion of the state included by a line drawn from Lake Michigan south to the southern border of Edgar county, west to the west border of Shelby County, north to the middle of Logan County and west to the Illinois River, thence along the Illinois River to Peoria and north to the center of Bureau County and west to the Rock River and northeast along the Rock River to the Wisconsin line. Part of this section is in that area in which the water supplies are obtained from deep rock wells, but over one-half of the area has very few wells of this character, so that the low typhoid fever death rate in this section is due in part at least to the satisfactory water obtained from the drift. There is no county located entirely within this area in which the typhoid fever death rate exceeds 20 per 100,000. Not only can satisfactory municipal water supplies be obtained from the deep wells in the drift but many farms are also supplied by such wells. It is interesting to note that the one county in the northern half of the counties which has a typhoid fever rate of more than 40 is located outside of the deep drift area and that the one county in the southern half of the counties having a typhoid fever rate lower than 10 is located within the deep drift area.

In the southern portion of the state there is no opportunity to obtain a satisfactory water supply from deep rock wells because the water is salty. The drift is so shallow that it is impossible to obtain a sufficient supply of water for cities from the drift and individuals must rely on shallow drift wells for their water. In many cases dug wells of doubtful character are used. The large majority of municipal supplies in the southern part of the state are taken from streams. In most cases the water is used without filtration. In fact only 16 of the 60 water supplies obtained from streams, lakes or ponds within the state have filtered water. It is claimed in some of these towns that the water is used only for sprinkling or for manufacturing purposes, but it is difficult to prevent the use of such water for drinking purposes. Undoubtedly the high typhoid fever rate in the southern part of the state is due to a considerable extent to the lack of satisfactory general water supplies. Several communities are already considering the introduction of filtered

water and it is hoped that a better report of the typhoid fever conditions of the southern part of the state may be given in the near future.

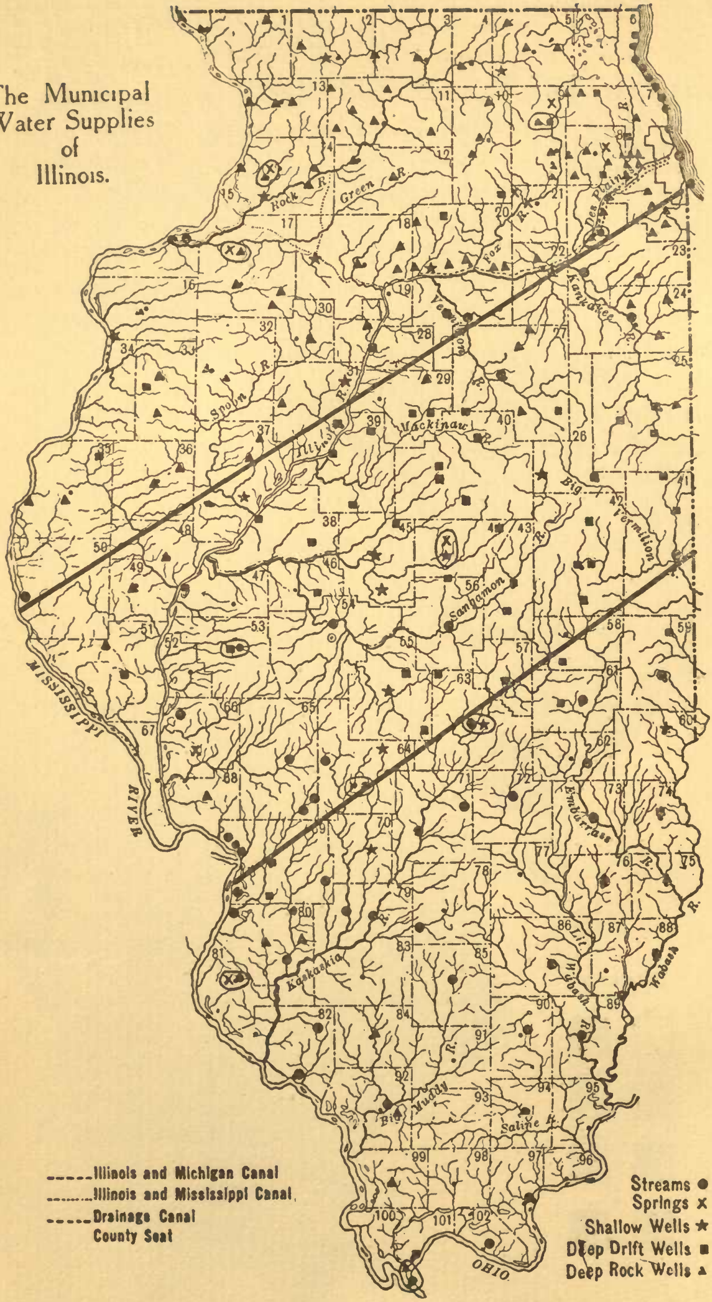
It is interesting to compare Macon and Sangamon Counties. These two counties are in the same latitude and contain large cities, Decatur and Springfield. The typhoid fever death rate of Macon County is 14 per 100,000, while that of Sangamon is 37. This is undoubtedly due to the fact that Macon County is within the deep drift area and the water supplies for farms and private individuals can be obtained from deep drift wells, whereas Sangamon County is outside of the deep drift area and the farms must rely on the shallow wells for drinking water. Then, too, the city water supply of Decatur in Macon County is filtered, whereas the water supply of Springfield in Sangamon County is sometimes augmented by unfiltered water from the Sangamon River.

An inspection of the map showing the average would indicate that the typhoid fever rate of Chicago was not materially increased by infection from the neighboring counties. There are, in fact, no counties within 100 miles of Chicago which have a typhoid fever rate materially greater than Chicago itself.



MAP OF ILLINOIS SHOWING DEATHS FROM TYPHOID FEVER
AVERAGE FOR FIVE YEARS 1904-08
LEGEND
30-35
40
JO DAVIESS
STEPHENSON
WINNEBAGO
BOONE
McHENRY
LAKE
CARROLL
OGLE
DE KALB
KANE
DU PAGE
COOK
CHICAGO
LAKE MICHIGAN
WHITESIDE
LEE
KENDALL
WILL
ROCK ISLAND
HENRY
BUREAU
LA SALLE
GRUNDY
PUTNAM
MERCER
STARK
MARSHALL
KANKAKEE
HENDERSON
KNOX
WARREN
PEORIA
WOODFORD
LIVINGSTON
IROQUOIS
HANCOCK
McDONOUGH
FULTON
TAZEWELL
McLEAN
FORD
VERMILION
MASON
SCHUYLER
DE WITT
CHAMPAIGN
ADAMS
BROWN
CASS
MENARD
LOGAN
PIATT
MACON
SANGAMON
DOUGLAS
PIKE
SCOTT
MORGAN
EDGAR
CHRISTIAN
MOULTRIE
COLES
GREENE
SHELBY
CLARK
CALHOUN
MACOUPIN
MONTGOMERY
CUMBERLAND
JERSEY
FAYETTE
EFFINGHAM
JASPER
CRAWFORD
MADISON
BOND
CLAY
RICHLAND
LAWRENCE
MARION
CLINTON
ST CLAIR
WABASH
WAYNE
EDWARDS
MONROE
WASHINGTON
JEFFERSON
RANDOLPH
PERRY
FRANKLIN
HAMILTON
WHITE
JACKSON
WILLIAMSON
SALINE
GALLATIN
UNION
JOHNSON
POPE
HARDIN
PULASKI
MASSAC

The Municipal Water Supplies of Illinois.



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REPORT OF COMMITTEE ON TYPHOID FEVER.*

This committee was appointed at the Winnipeg meeting last year to consider the reporting of typhoid fever—not alone to emphasize its importance but also and chiefly, to suggest measures to impress physicians with the necessity of reporting this disease—a matter much neglected in many communities and even over the larger part of many states.

Until the physician, who is really the scout of the public health service, reports back the location of the enemy, all our paraphernalia with all its elaborate organization, is at a standstill. Our scouts must not alone be skillful in recognizing the enemy, but faithful in notifying headquarters.

With all said and done concerning the immense powers of the practicing physician to aid popular education and to advance public hygiene and sanitation, it remains true that the greatest service the medical profession as individuals may render, the one service it is incumbent upon them to perform, the one service they alone are able to perform, the initial step essential to any form of public control of infectious diseases, (i. e., prompt, faithful reporting) is the very service most neglected. The principles of Medical Ethics of the American Medical Association devotes two sections (Chap. III) to the duty of the physician to the community, and makes it incumbent upon him to "co-operate with the proper authorities in the administration and the observance of sanitary laws and regulations" and also to "give counsel" and to "enlighten the public" in regard to many sanitary problems, including the handling of epidemic and contagious diseases. But the specific instance of the conscientious diagnosis and faithful reporting of infectious diseases as the great basic duty of the physician is nowhere directly mentioned.

Physicians hardly need encouragement to advise communities as to their sanitary problems for they generally do it voluntarily, and not always with the best results, for few practicing physicians are equipped to enlighten the public on the intricacies of modern professional public hygiene. On the other hand many physicians fail in the duty which lies nearest to them, peculiarly in their own province—diagnosis and report.

* Read before the American Public Health Association, at Richmond, Va., Oct., 1909.

Your committee divided the subject as follows:

1. Why the physician should report.
2. Why he often does not report.
3. What can be done to induce him to report.
4. A recommendation that the committee be continued or another appointed to approach the American Medical Association with representations on the subject and a recommendation that the American Medical Association definitely announce and urge through the code of ethics the reporting of infectious diseases, not in a perfunctory manner or under compulsion, but as a high ethical duty to humanity and to the medical profession itself, much more important than those duties to the public now specifically listed and which very often prove to be beyond the training and experience of the practicing physician to perform.

Each member of the committee contributed to the subject, and the chairman has approached the American Medical Association in the effort to determine how such a proposition would be received. Your committee believes that a conference committee, consisting of the members from each association might well be asked for, in order that such questions as the American Public Health Association may wish to lay before the physicians of the country, or such suggestions as the American Medical Association may wish to lay before the professional public hygienists, might have a definite channel through which to pass.

With regard to the other subdivisions of the report, Dr. John F. Anderson contributed the following section:

REASONS WHY PHYSICIANS DO NOT REPORT TYPHOID FEVER.

(a) LACK OF APPRECIATION OF THE IMPORTANCE FROM AN EPIDEMIOLOGICAL STANDPOINT OF A PROMPT REPORTING OF CASES OF TYPHOID FEVER. Many physicians have but a very slight idea what purpose the notification of typhoid fever plays in the control of the disease. They seem to think that the health officer uses the data only for the construction of "tables" overlooking the fact that unless we know how many cases of typhoid fever there are, where they are, and where they began, we can never hope to trace the source of infection or to lessen the ravages of this great scourge.

(b) Disinclination to Inconvenience the Patient's Family, for Personal, Social, or Business Reasons. Many people when told by their physician that there is a case of typhoid fever in the family bring pressure on him to prevent the case being reported, and often the physician either fails to report it at all to the health officer or reports it as something else.

(c) Uncertainty of Diagnosis. We all know how difficult it is in certain cases to make a clinical diagnosis of typhoid fever, and in such cases in the absence of the classical signs and symptoms and with no or a negative Widal, the physician does not care to report the disease as typhoid fever while he very probably believes that it is.

(d) Procrastination; He Intends to Report it But Puts it off from Day to Day. Very many times the physician has made his diagnosis perhaps early in the attack, but puts off reporting the case to the health officer, for no real assignable cause, until finally the patient is well and then he thinks it is too late.

The sections to be contributed by Dr. Chapin and Dr. Levy were on another subject, i. e., the simplification of reporting, a summary of which is as follows:

THE SECURING OF REPORTS FROM PHYSICIANS.

1. A very simple form of written report alone should be required, practically merely such as will enable the health officer to locate the case, the object being to get the central fact of the existence of a case at a certain place—regarding this as all the physician should be asked to do, and looking upon the immediate investigation of the case, with the collection of all the data and the institution of preventive measures as wholly the duty of the health department. Dr. Chapin accepts telephone or verbal reports gladly.

2. Every facility for diagnosis should be supplied by the health authorities, in order that the physician may be aided in arriving at a conclusive diagnosis early and also may be unable to excuse non-reporting on the ground of indecisive diagnosis. Dr. Chapin is inclined to believe that the sending of an inspector to make the tests on the physicians' request in doubtful cases

would simplify matters for the physician and induce greater use of these means and hence better reporting.

3. The best means of securing reports from physicians however is the making use of them early and energetically to the benefit of the patient and to the benefit of the community. There is indeed a general consensus of opinion amongst all public health men that the greatest reason for neglect of reporting by physicians is the belief on their part that the only value of the reports is in padding annual health department statistics. Where this is true, the health department is not doing its duty, and undoubtedly the most efficient and rapid method of bringing the physicians in any locality to realize the value of prompt and early reporting, is to use these reports promptly and wisely, not neglecting also to make it very evident to all concerned that SUCH USE IS MADE of them.

Signed,

JOHN F. ANDERSON,
E. C. LEVY,
CHARLES V. CHAPIN,
H. W. HILL, Chairman.

NOTE: The committee was continued in accordance with the recommendations made. H. W. H.

UTILITY OF THE DOMICILIARY VISIT IN THE CAMPAIGN AGAINST YELLOW FEVER.

By Dr. CARLOS MANUEL GARCIA,
Medical Inspector Third District, Vera Cruz, Mexico.

A slight epidemic of Yellow Fever which suddenly broke out at the end of May in last year, in the important port of Laguna del Carmen, in the State of Campeche, Mexican Republic, furnishes me with an opportunity of speaking a few words with respect to the utility of the domiciliary visit in the struggle against that much feared disease, a simple and rapid system of defence which was suggested by my Chief, the President of the Supreme Board of Health, which domiciliary visit is combined with other means for extinguishing the infection, of which we also know, that is to say: the isolation of confirmed or even suspected cases, and the destruction of the larvae and infected mosquitoes.

Before going any further, I must frankly state that the ideas which I at one time held with regard to quarantine have been radically altered since I have had opportunities to see for myself the magnificent results which we have obtained without the necessity of appealing to such a costly and arbitrary method for the preservation of public health. On the contrary, I now believe that the domiciliary visit as practiced in accordance with the teachings of the President of our Supreme Board of Health constitutes the practical and happiest application of the immortal discovery of Dr. Finlay.

As time would not allow me to enter at length on a study of the probable origin of this epidemic, I will omit it; but at the same time I must remind you that a well confirmed case of yellow fever, which may from one moment to the other come under our observation, must always lead us to presume the existence of one or more other cases, which, through special circumstances for example, the insidious manner in which it presents itself to our view, has passed unnoticed in its evolution. These circumstances are precisely those which have given rise to

*Read before the American Public Health Association, at Richmond, Va., Oct., 1909.

the doctrine that in those places in which Yellow Fever is endemic it is maintained alive by the children under ten years of age who are natives of the locality, as it is supposed that at that tender age these children are attacked by very mild forms of the disease, which is susceptible at the same time to being propagated by mosquitoes. As we have not yet obtained the experimental sanction of this doctrine, acting in accordance with the knowledge we have of these very mild forms of Yellow Fever we can understand the absolute necessity of isolating at the earliest possible moment, every non-immune, amongst whom I would include the children under ten years of age, even though natives of the locality, who present any feverish symptoms, which are not proved to proceed from some cause which cannot be attributed to Yellow Fever.

It is therefore easy to understand, that in order to carry out this isolation in a conscientious way we must first make methodical domiciliary visits which would allow us to make a judicious selection between the immunes and non-immunes. It is precisely this simple practice which characterizes our system of defence and constitutes its chief merit. I repeat that it was precisely this simple method which led to such a successful termination of the epidemic in Laguna del Carmen as well as in the Port of Vera Cruz, and which we hope will very soon be implanted in all other sections which are subject to sudden attacks of the expiring Yellow Fever.

THE CAMPAIGN AGAINST YELLOW FEVER ON THE ISTHMUS OF TEHUANTEPEC.*

By Dr. FRANCISCO VALENZUELA,
Mexico City, Mexico.

ORGANIZATION AND RESULTS.

The importance of the international traffic across the Isthmus of Tehuantepec has of late years brought to that beautiful region of our territory, so well adapted to agriculture and trade, a great number of people from distant states of the republic and from foreign countries, who have considerably increased the number of persons who are not immune to tropical diseases and principally to yellow fever, whose consequences are of such a fatal character. The number of victims who formerly succumbed to this terrible disease in the towns of greater or lesser importance and on the rural properties of the Isthmus was very considerable, the greater part of them having arrived there from remote and different climates, to take their chances in the hot country.

The agricultural conditions of this fertile and beautiful region, as well as its geographical situation, led to the establishment and development of international traffic across the Isthmus, which very soon assumed enormous proportions, on account of the easy and rapid communication between the terminal points, Salina Cruz and Coatzacoalcos. The traffic which was established by land and sea, and the arrival of non-immunes in a region in which yellow fever prevailed with sovereign power, led to a great increase in the number of victims, amongst whom were several nuns who had gone to establish themselves in Tehuantepec and died in the epidemic of 1904, as well as several passengers who adopted that easy route and also fell victims to yellow fever.

The satisfactory results obtained by the campaign against yellow fever, which, in accordance with the doctrine established by Doctor Finlay, had been undertaken in Vera Cruz, formerly the most prolific focus of that disease on the gulf coast, after

* Read before the American Public Health Association at Richmond, Va., Oct. 1909.

Havana, decided our government to extend this important service to the Isthmus, with which it had just been connected by the Veracruz and Pacific Railroad, now denominated Veracruz to the Isthmus, whose terminal point is in Santa Lucrecia. This line connects with the National Tehuantepec Railroad, which runs from Salina Cruz to Coatzacoalcos, now Puerto Mexico, and touches numerous towns of commercial importance as well as rich agricultural properties.

The Supreme Board of Health gave the necessary instructions for the organization of this campaign on the Isthmus, to Doctor Carlos Manuel Garcia, who has so efficiently contributed to the success of that service in the Port of Veracruz. A similar organization was established on the Isthmus under the same auspices as in the former port, and, due to the energy and capability of Doctor Garcia, that campaign was organized in the City of Tehuantepec in May, 1904. It was subsequently extended to the whole of the Isthmus, first in the southern part and afterwards in the northern, in which section of the State of Veracruz the campaign was initiated by Dr. Narcisco del Rio and continued by Dr. F. Gutierrez under the same form which was given to it by its initiator, according to the instructions of the Supreme Board of Health. That service is kept up to the present day. The excellent results obtained cannot be less than highly satisfactory and are a subject of congratulation to all who care for the health of our country, because we see in it a solid foundation for our progress and public wealth.

I will now proceed to give a resume of the principal points which have demanded attention during the campaign against yellow fever on the Isthmus, explaining its organization, importance and results.

The passenger traffic is under the charge of Sanitary Agents who travel on board the cars of the Tehauntepec Railroad, and whose jurisdiction extends to the respective zones of Cordoba, Salina Cruz and Coatzacoalcus, where the Chief Agents reside. This point is closely connected with all these railroad lines and they keep a watch on all the traffic, as well as on the terminal points above-mentioned. The travelling agent on the cars takes careful notes of the passengers, showing the point they come from and the point they travel to. Whenever one of these

is found sick, the Agent investigates as well as he can the circumstances under which the disease has been contracted, the principal symptoms, such as temperature, etc., which would facilitate his determining those points. He also takes into consideration the sanitary conditions of the locality from which the sick person comes, and takes all the necessary precautions. Whenever the symptoms presented give rise to any suspicion which is corroborated, he increases his precautions, and reports to the Agent on the train with which the passenger desires to connect, together with such observations as he has been able to collect. At the same time he forwards a report to the sanitary authorities of the place the sick man is going to, in order that he may be submitted to strict surveillance until the disease from which he suffers is clearly defined and the proper measures can be taken. The Agent or Agents who may have discovered any such case, make a full report on arrival to the respective Chief of the service, who then takes the steps which the case may require.

In the course of his trip, the Travelling Agent collects all the news which the political and sanitary authorities may give him, and in his turn reports them to the nearest Chief of the service, by wire if the case so requires. This service is of very great importance, as it enables the respective sanitary authorities to receive daily and timely reports of all cases of disease which present an alarming character, and also to take the necessary steps for the isolation of the case and attendance, whether the patient was found on some car or a resident of some town.

The railroad cars are fumigated on their arrival as well as departure from their terminals, so as to destroy the mosquitoes which might be found inside. The substance employed with great advantage over all others known is sulphurous acid (20 grams to 1 cubic meter) which kills them with promptitude and certainty and the same substance is employed whenever it is necessary to fumigate any vessel.

The results of this service are evidently of great utility and efficiency, because by the prompt isolation of the patient and other precautions taken the principal source of propagation is destroyed and the subsequent surveillance exercised determines the nature of the disease. The daily reports which the Chiefs of the service receive from the Travelling Agents give them an

exact knowledge of the sanitary conditions of the region travelled by those Agents and permit them to rapidly take all the steps which may be necessary to restrain and even extinguish the disease.

Town Service. This service is permanent in the more important towns of the Isthmus, whether for the number of inhabitants, as in Tehuantepec (15,000), or for their importance to traffic, as Salina Cruz, which now has 3,000 inhabitants and formerly 8,000, as well as Coatzacoalcos with 10,000 inhabitants, bearing in mind also the floating population, amongst which are a great many non-immunes. In the towns of minor importance, it is established only when the circumstances require it, without prejudice to a constant vigilance which is exercised by the resident political and sanitary authorities.

The staff employed in this service is in proportion to the importance of the town and is distributed therein by zones, over which vigilance is exercised as follows: They keep a register of the people in which they note those who are immune or non-immune who live in the respective zones; they investigate whether any are sick, the nature of the disease and the attendant circumstances; they watch over the isolation of the sick, in case this is necessary, and also over those who arrive by railway; both the latter as well as the residents of the town are taken to the lazarettes, whenever their dwellings are such that they cannot guarantee a strict isolation. They fumigate those dwellings so as to destroy the mosquitoes which may have been inoculated, by means of sulphurous acid, 20 grams sulphur to 1 cubic meter, and they spread oil over the ponds and swamps in order to destroy the larvae of the mosquitoes which they might contain. The chief of the sanitary brigade presents a daily report of the work done and of everything he may have observed within the zone under his care, to the Chief Delegate, who in his turn sends a telegraphic report to the President of the Supreme Board of Health.

The isolation of the sick, the destruction of the mosquitoes by fumigation and the covering of ponds and swamps with oil to destroy the larvae, result in the disassociation of the three principal factors in the propagation of yellow fever. The satis-

factory results thus obtained, are constantly confirmed by statistics.

Country Service. The numerous agricultural properties which exist on the Isthmus have been invaded by this terrible disease and suspicious cases sometimes appear there whose character it is necessary to define. The same thing happens in the small hamlets occupied by natives of that region, many of which are found on the banks of the rivers, surrounded by swamps and therefore propitious to the development of mosquitoes. In all these cases the health of the people is watched over by the proprietors or managers of the properties as well as by the municipal authorities, who as soon as they note the presence of any person suspected of sickness notify the nearest sanitary officer by wire or telephone, and the latter either personally or through his subordinates proceeds to take the steps which may appear necessary. The assistance which is generally found both amongst the inhabitants as well as the authorities is of great importance, and this is due to the information which little by little has been spread among them by means of the pamphlets which the Supreme Board of Health has profusely distributed and which have been specially written for the superintendents of traffic on the railroads, for the proprietors of country properties, for the resident authorities and physicians, and for general information. These pamphlets give clear and concise instructions on the principal factors in the propagation of yellow fever, the means now at our disposal for its suppression, and the practical methods for taking advantage of those means.

The timely information which the sanitary authorities may obtain of the existence of any suspected case allows them to take prompt measures for preventing the spread of the disease and even for suppressing it altogether. The resulting defining of the nature of the disease and taking prompt measures to prevent its spread and secure its extinction not only are of great benefit but also re-establish tranquility in the region affected and its neighborhood, as well as throughout the country and abroad, thus preventing any serious impediments in the way of international traffic. Wherever this sanitary service is established the methods adopted are of a uniform character, and amongst them I must mention the use in dwelling houses of fumigation with the

assistance of the canvas covering invented by Dr. N. del Rio, who rendered such important services in the campaign against yellow fever in Veracruz. This canvas cover is extremely useful because it is specially adapted to the houses of that region, as it completely covers the hut in the interior of which the fumigation is made with sulphurous acid (20 grams per cubic meter), which slowly penetrates the interstices of the thatch with which they are covered, thus killing all the mosquitoes which take refuge there, which cannot escape on account of the canvas cover.

In some places in which the land is very swampy and where cases arise of an alarming character, mosquitoes are found as abundantly of the genus Anopheles as of the Stegomia, and it is necessary to examine the blood of the patient so as to form a diagnosis of his disease. In the month of August, 1908, in a small village of 400 inhabitants called Huilotepec, distant 10 or 12 kilometers from Veracruz on the right bank of the River Tehuantepec, a disease rapidly spread which greatly alarmed the residents. The Sanitary Chief in Salina Cruz proceeded to that place as soon as he had notice of the epidemic character of the disease and promptly took the necessary measures, of which the principal were the isolation of the patients and the fumigation of the houses. An examination of the blood of some of these patients demonstrated the presence of the Laveran Hematozoaria and the satisfactory results obtained by their treatment, principally with quinine, confirmed the first diagnosis, although the disease had presented itself in a truly alarming aspect. This method is very valuable in determining the nature of the disease in individuals who live in secluded places, as without prejudice to their isolation the disease is promptly diagnosed and treated as required.

I have had the honor to present to this learned Association, a resume of the organization and results of the campaign against yellow fever on the Isthmus of Tehuantepec, which have been confirmed by the statistics of the last three years, and which show how yellow fever has disappeared from the Isthmus. It is a subject which proves its importance for itself, as it will give the entire American continent a knowledge of our sanitary conditions and will confirm the confidence and guarantees which our ports offer to countries which have trade relations in Mexico. In the

meeting held on the 7th of December, 1907, of the third Pan-American Sanitary Convention, in the City of Mexico, Doctor Wyman frankly expressed on behalf of the United States his admiration for the worthy President of our Supreme Board of Health, in the following terms: "The United States cannot be behind hand in expressing their admiration for Doctor Liceaga. We are his nearest neighbors and for many years have heen the witnesses of his earnest efforts in favor of Hygiene and Public Health. Nowhere has Doctor Liceaga more sincere admirers than in the United States, and we desire that this assertion should be taken at its full meaning, and will also take great pleasure in subscribing any document which may express such sentiments."

If these spontaneous and sincere expressions on the part of the distinguished American physician were only inspired by the efforts at that time made in our campaign against yellow fever as undertaken on the Isthmus of Tehuantepec, now when success has crowned those efforts, the expressions of confidence in the public health of Mexico, as personified by Doctor Liceaga, will certainly merit the approval of each and every one of the worthy representatives of the American republics who are here present.

ANNUAL REPORT ON YELLOW FEVER IN THE MEXICAN REPUBLIC, FROM AUGUST 16, 1908, TO DATE.*

By Dr. EDUARDO LICEAGA,
President, Superior Board of Health, Mexico City, Mexico.

For the last sixteen years I have presented in every annual meeting of this Association, a report on the course of Yellow Fever in the territory of the Mexican Republic. I now appear before you again to fulfill this engagement which I have assumed with the Association, and present a report of the cases of Yellow Fever which have been observed from the 16th of August, 1908, to the 5th of October, 1909. During this period of time, cases have been registered in the City of Veracruz, in the months of September, October, November and December of last year, whilst in the current year we only had one case in January and another on the 11th of February. To these I must add a case which was imported on the 24th of September last, and which was at once isolated after being landed, and the ship disinfected. This patient died in the Hospital.

As can be seen, from the 11th of February of this year, when a single case was observed, we have not had another autochthon in that Port. I desire to impress this point on my hearers, because we have been unable to find any explanation of the following case:

A Spaniard named Federico Gallo Mancilla, a resident of Puebla for the last three years, went down to Veracruz on the 12th of June last, and remained there until the 16th, when he took passage in the Steamer "Furst Bismarck," of the German Line. On the second day after embarkation he fell sick, and on the 19th, when he reached Havana, he was isolated in the "Las Animas" Hospital. There it was ascertained on the 22nd of June that he was really suffering from a mild form of Yellow fever. This case has given rise to a controversy between the sanitary authorities of Mexico and Cuba. The latter have maintained that the disease was contracted in Veracruz.

As no case whatever has been observed in that Port since the 11th of February of this year, if we admit that Gallo Mancillo contracted the disease in Veracruz, we would have also to admit

* Read before the American Public Health Association at Richmond, Va., Oct., 1909.

that an infected mosquito had remained since February and that this mosquito had stung Gallo Mancilla and inoculated him with the Yellow Fever. But if we admit this theory, we must also admit this other; that Gallo Mancilla had the special privilege of being stung by an infected mosquito which did not sting any other of the ten thousand non-immunes who constantly reside in Veracruz, during the time which elapsed from the 11th of February to the 16th of June, and that this infected mosquito did not inoculate any of the ten thousand non-immunes who have continued to reside in Veracruz from the 16th of June to the present date. Neither of these theories is admissible.

In the Island of Cuba it appears that the following supposition prevails: that the children who are born there, contract Yellow Fever in a very mild form and with symptoms which can hardly be noticed, and it is supposed that these children infect the mosquitoes which later on give rise to the isolated cases which appear to be spontaneous. In the case of Gallo Mancilla we cannot accept this explanation, because then we would have to assume that a mosquito infected by a child suffering from an anomalous form of Yellow Fever only stung Gallo Mancilla, without stinging, either before or after, a single one of the ten thousand non-immunes who reside in Veracruz.

The case I refer to has up to the present received no satisfactory explanation, but I present it as a well established fact.

It may be said that the State of Yucatan is where isolated cases of Yellow Fever persist in appearing even now, because although it is true that small epidemic foci existed in the last months of the past year, in this we have observed only isolated cases, six in January, two in March, one in May, one in June, two in August and two in September, and none at all in the months of February, April, July and October up to the present. We therefore see that there is no epidemic in Merida at present.

With respect to the cases observed from November, 1908, to the date of this paper, in different villages or country properties of the State of Yucatan, they will be better understood from the diagram which I have the honor to present together with this report. As a summary of that diagram, I may state that from the 11th of February of this year not a single autochthonic case of Yellow Fever has been observed in Veracruz; that neither has the disease presented itself in any other Port of the seaboard of

the Gulf of Mexico during the period elapsed from October, 1907, to date, with the exception of those cases in Laguna del Carmen which I reported last year, and also that observed in Frontera, which was imported, as stated in that paper; and that at present there is no epidemic in the State of Yucatan, but only some isolated cases in Merida and in some of the villages or plantations round that city.

Every week I send an official report on the course of Yellow Fever in our country to all the Republics which have accepted the Sanitary Convention which was subscribed in Washington on the 14th of October, 1905.

I must make the following declarations to the members of this Association:

The campaign against Yellow Fever, which commenced in the Mexican Republic in the year 1903, has continued uninterrupted up to this date, without even suspending it during the Winter months as is done in other countries; that the war on the mosquitoes is so efficacious that there are none left in Veracruz, and consequently, there are no stegomyas, as demonstrated by the reports rendered by the physician of the Public Health and Marine Hospital Service of the United States, who is resident in that Port.

The cases which have been observed in Merida and surrounding villages, arise from the existence in that city of over thirty thousand water tanks which could not be so easily and securely watched as those of Veracruz.

In the entire section which was formerly devastated by Yellow Fever we continue to canalize the deposits of standing water and to fill up the hollows, as well as to spread oil on all those ponds which cannot be otherwise filled in or covered.

We continue to fumigate the dwelling houses, workshops, schools, etc., in which we have encountered either cases of Yellow Fever or any suspected cases.

We continue the surveillance over the passengers who travel by rail in any part of the region which formerly suffered from Yellow Fever, and this service is especially active along the line of the Tehuantepec Railroad.

In the Ports of Coatzacoalcos, on the Gulf Coast and Salina Cruz on the Pacific, it is nearly four years since a single case of Yellow Fever was observed.

DISCUSSION.

Dr. WALTER WYMAN, Washington, D. C. These three papers which have just been read I have listened to with a great deal of interest. The papers, and the fact of their presentation here, gives evidence of the care which is being taken by the Mexican authorities in suppressing and eliminating this dread disease of yellow fever. The contents of these papers shows that they are doing it.

Two years ago in the City of Mexico at the International Sanitary Convention of American Republics, Doctor Liceaga, the distinguished President of the Superior Board of Health, made the astonishing claim that they had eliminated yellow fever from the Republic of Mexico. It made somewhat of a sensation, and of course something akin to a small interrogation point arose in the minds of some of us, but we listened with respect, for we know what they had done; and I want to say that since that date, and especially during the last summer, the results have really justified that statement. When you think that only a few years ago Vera Cruz was one of the worst infected ports on the western continent; that it was a constant menace to the United States; and that now, through the scientific and sanitary efforts of the Mexican Government, inaugurated by Doctor Liceaga and backed up by President Diaz, it is free from that infection, I think you will all agree that the present status is a remarkable evidence of the intelligence and energy of our southern neighbors.

Not only did Doctor Liceaga say that he felt they had eliminated yellow fever from the Mexican Republic, but he said that the forces which they had been using to that end are now turned against malaria, and that they expected to eliminate malaria from the Mexican Republic. Gentlemen, that is not only a work, an ambition, and an expectation that is worthy of commendation, but it is something that should stimulate us. I believe they have given more attention to the destruction of the mosquito and the elimination of malaria and yellow fever than we have in this country, and we really can listen to them in this respect. The past year has been one comparatively free from yellow fever in other countries as well, but it is due, I believe, to the increased attention that is being paid to sanitation all along

the Spanish Main and the South and Central American Republics. Yellow fever is practically eliminated from Rio Janeiro. This is not a haphazard result, but is due to sanitary measures. Of course, we know about Cuba and the Canal Zone, and without doubt the honest and effective work in these two countries has had a marked effect by example. Then, too, the presence of medical officers of the Public Health Service, detailed in some eight or ten of the fruit ports in Central and South America, to make sure that the ships shall be free from infection before leaving, has had a sanitary influence on these Republics.

Whether all who are here feel a special interest in the matter of yellow fever or not, it is a cause for congratulation that a disease which used to sweep over this country, and infected constantly all our neighbors, appears now to be practically wiped out. Of course, one swallow does not make a summer, and one or two summers of freedom from general infection is not enough to make us rest content, but still it is very encouraging, and it looks very much as though we had conquered in this western hemisphere the disease called yellow fever. (Applause.)

Dr. PETER H. BRYCE, Ottawa, Ont. I wish to add for myself, and I think for all the representatives of my country a word of tribute to the splendid—one might say heroic—efforts of Dr. Liceaga and his splendid Board of Health in the stamping out not only of yellow fever but in the true work, the greatest work we are all engaged in, that of public hygiene. When I listened for two hours this morning to the discussion of the splendid papers on typhoid fever, and listened to the expressed expectation as a matter of course of those who read the papers of a certain level of typhoid in the different cities being maintained year by year—as I heard the story of flies as the common cause of it in certain southern districts and northern districts as a thing to be expected, and then when I turned and listened to the splendid story of the results of public health efforts in a country where I dare say the fight is more difficult against the foe, still very well intrenched because of the difficulties of getting at him, and when I realize how easy a problem we have in controlling great epidemics like typhoid fever by the municipal regulation of water and milk, and when I see that we are not putting up any

very positive fight to this end, I feel that we can hardly congratulate ourselves in the northern states for the fight which is being waged against typhoid fever while we must admire the performance of the magnificent task that Dr. Liceaga and his Board has taken in hand and accomplished in stamping out disease. It makes no difference whether it is typhoid fever, smallpox, yellow fever or indeed tuberculosis, which we are all fighting against today. The only question we have to ask is: Are all fighting effectively? I cannot withhold my tribute to the splendid example set us by Dr. Liceaga and the splendid Board of Health of Mexico City.

Dr. FREDERICK TORRALBAS, Havana, Cuba. The yellow fever is a question always very important to Cuba, and in this case I am obliged to say a few words about it and touch upon a few points which have been considered in the three very interesting papers sent by our brothers of the Republic of Mexico.

In the first place, in the paper read by Dr. Garcia of Mexico, in which he refers to the house to house inspection, I might say that Havana is today in such a condition in that line that we control entirely the history of any case of yellow fever which may occur from its very beginning. For this purpose we have sixty-two District Inspectors who are in charge, visiting every house in Havana, and making an average of twenty thousand houses every ten days, which would cover the whole town a little less than three times during a month. These Inspectors are supposed to look after the whole sanitary condition of the house and more especially the work connected with the destruction of mosquitoes. The Inspector has an assistant with him who is supposed to go to every house, and destroy all deposits of larvae which may have been deposited since his last visit. In that line we have made such a good record that in twenty thousand houses inspected larvae were found in only fifty-two. We have fought not only typhoid fever but also malaria to such an extent that the medical students in Havana very seldom see a case of malaria. (Applause.) They have to be taken down to Los Animas Hospital where we get only the cases imported or brought in from the interior of the country. I am very sorry that Dr. Liceaga is not here to discuss a case of yellow fever that

we had, I think imported from Vera Cruz this last year. Dr. Liceaga states that in the Island of Cuba it appears that the following superstition prevails, that children who are born there contract yellow fever in a very mild form, and with symptoms which can hardly be noticed, and it is supposed that those children infect the mosquitoes, which later on give rise to the isolated cases which appear to be spontaneous. This is true, and in the last epidemic we had then as witnesses quite a good many officers of the United States Army well posted in all sanitary matters, and they saw three cases. I remember one of them, and I mention this case because it created quite an excitement in Havana. The child was only four years old and just at the beginning of the epidemic it got sick and was reported by the attending physician as a case of dengue, which was prevailing to a slight extent at the time. The case was taken up before the Commission on infectious diseases, which is composed of members of large experience, at the head of which is a man very well known in the United States as an expert in yellow fever, Dr. John Guiteras. The case on the third day was postponed, but not in the same way as the cases that are not diagnozed as yellow fever. They postponed the case, and immediately thereafter ordered disinfection of the house. This child was living about five miles from the place of infection, but the day before he took sick he came to the harbor to meet friends on a boat coming from Mexico. He was not allowed to go on board on account of the law prohibiting all non-immunes to go on board vessels coming from infected ports. This child had no connection whatsoever with any of the foci, nor did any other case develop later in the surrounding blocks, nevertheless the case was pronounced one typical of yellow fever in a child five years old by the Commission, acting unanimously. I mention this case because of this statement in Dr. Liceaga's paper.

I would like to refer to the use of canvas. We have been able to disinfect in that way towns of fifteen thousand inhabitants in a single day.

Dr. W. M. BRUMBY, Austin, Texas. I, too, would like to congratulate Dr. Liceaga and his Superior Board of Health of Mexico upon their most admirable work. The sanitary work

done in Cuba has been very well done and many of us look upon it with envy. I venture to say that there is not a city in the United States that has better drainage, better paving and a greater percentage of its houses connected with a sanitary sewer and good water than Vera Cruz. The whole city is paved and everyone is required to have sanitary connections. I hope you gentlemen caught one point there too, and that was the fact that not only the domiciliary visits were made but the closest espionage possible was kept of every non-immune that goes into the "hot lands" of Mexico. One fact that we learned is that no chain is stronger than its weakest link. The weakest link in that chain is the fact that all immunes that visit that land are lost sight of as soon as they get back to the City of Mexico, although it is only two days and eleven hours from suspicious territory until they get back to the city of San Antonio in Texas. So short a lapse of time will allow a person contracting yellow fever in the hot lands of Mexico to reach Texas. Well within the period of incubation, the disease develops later and infects our state. I think this chain of espionage should be continued on into the United States so that proper precautions can be taken if such person takes sick.

Section of Municipal Health Officers

A LIMITED OUTBREAK OF TYPHOID FEVER DUE TO A DOUBLE WATER SUPPLY.*

By ALEXANDER JOSEPH DOUGLAS, M. D.
Medical Health Officer, Winnipeg, Man.

Water-borne outbreaks of typhoid fever are so common that I am sure everybody here has had some personal experience with them, and if it were not for the fact that the outbreak I propose to set before you presents rather unusual features I would not venture to occupy your time.

In the month of October, 1908, typhoid fever began to make its appearance among the men working in the yards of the Canadian Pacific Railway Company in Winnipeg. These yards comprise an area of about 1,000 acres, contain many buildings, and a large number of men are employed therein.

Cases were reported on the following dates, viz.:

October 19th	1	November 11th	1
" 20th	1	" 12th	1
" 27th	3	" 16th	1
" 30th	1	" 17th	2
November 3rd	1	" 18th	3
" 6th	3	" 19th	1
" 9th	2	" 21st	1
" 10th	3	" 30th	1

The occurrence of these cases in the same vicinity at a time when the city as a whole was singularly free from typhoid pointed to a common origin. A very careful investigation was made into all the particulars surrounding each case, it was found that the affected individuals varied widely in habits, place of residence, and boarding place when away from the yards. In but two instances out of a total of 26 men were these similar. The only points possessed in common were that all worked in the C. P. R. Yards and during business hours drank the same water.

* Read before the Section of Municipal Health Officers of the American Public Health Association, at Richmond, October, 1909.

The C. P. R. Yards are furnished with two sets of water mains; one of there contains water from the domestic supply of the City, which, derived from a series of artesian wells driven in rock, is of great purity. The water from this source is used by the Company as a drinking supply for its employees and for filling the drinking water tanks of its coaches. The other set of mains carries water drawn from the Red River—a highly polluted stream—and pumped by the City High Pressure Station for fire purposes through a restricted area. This river water is utilized for filling locomotive and stationary boilers and is employed on account of being much softer than the domestic supply. The pipes carrying these two waters ramify extensively throughout the yards and the various buildings within them, and in some places are situated close together.

Samples of drinking water were systematically taken everywhere accessible, and on November 18th, after a great many samples had been tested with negative results, water was obtained from a certain drinking tap from which it was possible to obtain bacillus coli in every instance. This organism is never found in the domestic supply of Winnipeg but always is present in Red River water. The building from which the suspicious samples were obtained was one of the places where the two sets of pipes were close together, and a careful examination revealed that a connection existed between them. The man in charge of the building (a gasometer house) admitted that he had connected the two early in October in order that should the high pressure supply for any reason fail, an incident that had once occurred owing to a break down at the pumping station, he would be able to fill his boilers from the domestic mains without loss of time.

When the connection between the two systems was found the course of events was very evident. Domestic water is forced through the mains at a pressure of between 40 and 50 pounds per square inch, the high pressure river water at anything between 150 to 300 pounds. When these two waters met the river water forced the other back up its own mains and replaced it there for a considerable distance. Individuals using water from this line of pipe supposedly containing artesian well water were really drinking water from the Red River into which all

the sewage of Winnipeg is discharged. It is to be noted that, with one exception, the affected persons had never been near the gasometer house at all, they obtained their water at a considerable distance from it.

The existence of this connection was definitely established on November 19th, when it was at once abolished. Cases of typhoid continued to arise until November 30th which was the last.

In all 26 cases occurred with 3 deaths. I trust this brief paper will serve to illustrate the danger of a double water supply, one good and one bad, to any locality, especially when the mains come close together here and there throughout their course. Any irresponsible individual may work great harm by interfering with the arrangements of the pipes to suit his own ideas. In this case the accident happened contrary to the regulations of the Company and the City of Winnipeg. The man responsible received a very severe lesson, but after all no reprimand or punishment that it is possible to inflict in such a case can repair the damage done. The only safe way would appear to be to arrange the two supplies—if there must be two—in such a manner that it is impossible to effect a direct connection between them.

METHODS OF CONTROL OF COMMUNICABLE DISEASE BY BOARDS OF HEALTH, ESPECIALLY IN SMALL COMMUNITIES.*

By FRANCIS GEORGE CURTIS, M. D.,
Newton, Mass.

In the following pages an attempt will be made to indicate the manner in which Boards of Health may best accomplish the work of attempting the control of communicable disease, more especially in the smaller communities where the means are more or less limited and the work must be carried out by a small staff. In larger communities there are undoubtedly other problems, fully as important, which confront the health officer but these cannot be spoken of here, and I shall confine myself to those which have come under my personal observation and attempt to show what can be done to overcome them.

In looking over the field of work it is evident that the effort should be directed along two main lines, namely, first, what shall be done to lessen the liability of an outbreak, and second, what shall be done after the outbreak has occurred. It is hard to say which is the more important of the two lines of effort, perhaps they are equally important each in its own way, but the problem of prevention is probably the more difficult to carry out efficiently and for this reason will be considered first.

The first step in the direction of prevention comes in getting sufficient money to do proper work. Indeed, unless there happens to be an outbreak of communicable disease in progress at the time that the annual appropriations are granted, there always develops on the part of the City Fathers, to whom we must look for the approval of our estimates, a strong tendency to economize in the matter of the appropriation for the Health Department.

It is very difficult to make the average member of a city government realize the necessity of preventive work which is of value in educating the public to a proper knowledge of how

* Read before the Section of Municipal Health Officers of the American Public Health Association, at Richmond, October, 1909.

to live as opposed to the visible steps which are taken when an outbreak is in progress. In that phrase "educating the public" I believe, lies the secret of efficient work in the prevention of communicable disease and also, in getting sufficient means to do that work, and we must bend our efforts in that direction.

The day of concealment and mystery has passed and we are all agreed that a very important branch of the equipment of a health department is what, for want of a better name, may be called "the publicity bureau."

People must be taught what the health department is doing and why it is doing it, so that they may recognize its value and be willing to sustain its acts. The work of the publicity bureau is of course educational and should be directed along two main channels, namely, the education of the adult members of the community and which is fully as important, the education of the children in the public schools.

There are several ways available of attempting to accomplish the first of these, and perhaps the best is by publishing a regular monthly bulletin of information and simple articles on the best methods of avoiding disease. This method, while undoubtedly the best, is expensive and may be beyond the reach of many health boards but almost the same result may be reached by occasional letters dealing with similar subjects to the local daily or weekly papers. Almost every city of any pretension nowadays has its daily or weekly paper and the editor is always glad to publish free of charge such articles, so that where this plan is followed the only expense to the department is the wear and tear on the brain of the man who prepares the article.

One health department has established a correspondence bureau to which letters may be sent asking for information on any subject that can properly be treated by the department. The letters, with signatures omitted, are published in one of the papers of the town, together with the appropriate reply. In this way much information can be imparted not only to the writers of the letters but also to the other readers of the paper. This method seems to be a very valuable adjunct to articles dealing with general subjects.

In the writer's own city, people are urged to call up the office of the health board by telephone, or to visit the office personally and ask any questions they may wish, not only in regard to matters of general hygiene but also in regard to the action of the board in any specific case. While this method does not reach as large an audience as the ones just referred to, it has been found of value and hardly a day passes that one or more persons do not avail themselves of the opportunity. Indeed, during the last winter when over 50 per cent. of the children in a certain school were kept at home by their parents from an unfounded fear of scarlet fever, it was found that a few minutes' frank talk with a parent, explaining the measures which were being taken to check the outbreak, usually resulted in the return to school of the children of the person making the inquiry, showing that a lack of knowledge was at the bottom of much of the alarm.

In addition to being urged to ask questions as to the reasons for certain acts of the Board of Health and in regard to anything in relation to communicable disease, the general public is quietly encouraged to report to the office any suspicious circumstances which may be noticed. This gives the department a large number of persons who may at any time give valuable information, and that it is at times valuable is shown by the fact that within the past six months information of a suspected case of scarlet fever was received by the department, information which enabled the writer to pay a domiciliary visit and discover the existence of a concealed case of scarlet fever.

Another method by which this education of the public can be attempted is by the aid of the services of trained nurses. Even in cities where it is too expensive to employ trained nurses directly under the control of the Board of Health, there is usually a District Nursing Association or some similar organization, and an arrangement can be made by which the services of the nurses may be available for educational purposes. This can be done at very little extra expense to the department and will prove most valuable. The nurses reach a class of people who need instruction, and their advice and instruction will be heeded better than those of an official representative of the Board of Health, for it is the experience of the writer that the

Health Officer is, in many instances, looked upon as a sort of enemy, whereas the District Nurse, on the other hand, is considered as a friend, whose advice is to be heeded.

The affiliation of the health authorities with the District Nurses is of value in other ways also, such as the early detection of cases of communicable disease and other conditions detrimental to the public health. In such cases there is need of care on the part of the Health Officer when he makes his visit, for if the nurse is thought to be working as an inspector of the department she may lose her value as an instructor.

In the Medical Inspection of Schools we have another very valuable means of preventing an outbreak of communicable disease, although there is still room for improvement in the methods. In Massachusetts medical inspection is now compulsory, and some form is carried out in every community in the commonwealth. It is to be feared that as a rule, especially in the smaller municipalities the inspection is very perfunctory and consists chiefly in a brief visit by the inspector who inquires of the teacher if there are any children for him to examine. While this form of inspection is better than none at all it is far from what we should aim at, and it is to be hoped that it will become less frequent as time goes on.

In the writer's own city the inspection has been extended somewhat beyond the limits required by the statute and in the short time that the custom has been in existence it has proved to be very voluable and not more expensive than the old method.

Under this system each inspector has supervision over the public school children in his district, whether they are at school or not, and is required to know their condition as far as possible. It often happens that a child is absent from school for several days without any known cause, and often the rumor is passed about among the children that such and such a one is ill with some communicable disease. In either event it is the duty of the inspector to pay a visit to the home of any child who has been absent from school over forty-eight hours without known reason, and find out if he is ill. The result of the visit must be reported to the Board of Health, no matter whether the child is found well or ill. Of course such a system entails many visits when nothing dangerous is found, but if one child out of many

visited is found ill with communicable disease, it more than makes up for a large number of useless visits.

During the past year in two different instances children were found in the early stages of scarlet fever, and as the parents had no idea that the illness was at all serious and consequently had not called a physician, what might have been a sharp outbreak of scarlet fever was prevented. Occasionally the parents are inclined to resent the visit of the inspector, especially if there is no illness present, but a slight explanation usually soothes their ruffled feelings, and they are pleased to feel that such good watch is being kept over the children in the schools.

The Medical Inspectors of schools may also be used to instruct the children under their supervision in regard to general hygiene and more particularly in the best method of avoiding the danger of contracting communicable disease as far as possible. Instruction may be given by means of short talks to the children in simple non-technical language. Arrangements can be made with the school authorities to give these talks during the school session, or the use of a room may be granted for a lecture after school hours. The former method is of course to be preferred as a larger numerical attendance will be assured, and no valid objection can be raised that it interferes with the regular school work, because in many states instruction in hygiene is required by law and the lecture can be interpolated in place of the usual text book instruction.

The practicing physicians are a valuable adjunct of the Board of Health in preventing an outbreak of disease, and by making early reports of the occurrence of a case may give most valuable help. In Massachusetts every physician is required to report immediately in writing over his own signature each case of a disease dangerous to the public health which may occur in his practice. Physicians should be urged to supplement this report by telephone as in this way several hours and sometimes a whole day may be gained. Where the telephone is used it has often happened that the patient has been removed to the hospital, and all the routine work finished, many hours before the report is received. In this way a possible focus of infection is disposed of at the earliest possible moment and much valuable time saved. The telephonic report must not be permitted to

take the place of the written notification, as the latter may be of value in freeing the Board of Health from blame in case of a patient sent to the hospital on a misdiagnosis.

The relation between Boards of Health and the physician is a subject outside of the scope of this paper but the writer can truly say that in an experience of some fifteen years he has found his fellow physicians always ready and willing to assist the work of the Board of Health in any way possible, whether it be in urging the removal of a patient to the hospital or in giving voluntary aid when an emergency which taxed its resources confronted the Board, and it is his fixed opinion that the practicing physician may be considered as the outer line of defence against the attacks of communicable disease.

Even a laboratory for routine work can be established and maintained at comparatively little cost, for even if the expense is too great for one community an arrangement can probably be made to establish one, the expense of which may be shared between two or more neighboring municipalities. Should such a plan be impracticable, as a last resort some laboratory man can be found who will be glad to do the work of examining cultures, etc., when necessary, at a slight fee for each examination. This plan is better than relying on the assistance of the State Laboratory, for the returns can be received more quickly and the element of time is of value in such cases.

We come now to the question of dealing with communicable disease after it has broken out in the community and here we have to consider what shall be done with the patient himself, what shall be done with the other members of the family, and last, but by no means least, the discovery of the cause and its removal if possible. In considering the question of what shall be done with the patient the duty of the health department is merely to see that he does not become a source of danger to others. It is not within the scope of this paper to speak of specific cases but of the management of cases in general.

The first question is: "Shall the patient be taken to a hospital or isolated at home?" In ninety-nine cases out of a hundred the reply should be that he must be taken to a hospital, if possible. It is better for the patient himself and infinitely better for the public that this should be done. Almost all small

cities now have a hospital within their limits, and there is almost always an isolation hospital connected with it, and even when the city is not fortunate enough to have a hospital of its own, there is usually one within easy reach, and an arrangement can be made with it to take such cases. By removing the patient to an isolation hospital the annoyance of house quarantine is avoided, and the wage earners of the family may, in most cases, continue at work, thus avoiding a loss of income at the very time when the income is most necessary. Sending the patient to a hospital may even be less costly in actual dollars and cents to the city than keeping him at home, especially among the poorer members of the community. Often the mere suspicion of "contagious disease" in a family is sufficient to cause the wage earners to lose their positions, and if the family is not fortunate enough to have something laid by for a rainy day, the support of the whole family, instead of one member, may have to be borne by the city.

If there is no isolation hospital, or if for any reason it seems best to allow the patient to remain at home, the usual isolation of the sick person must be enforced.

The chief objection to isolation at home is found in the difficulty of knowing that the rules are properly carried out. It is here that the co-operation of the family physician is very valuable and must be relied upon chiefly, but it is well to supplement this by an occasional visit by the Health Officer.

When we come to the consideration of the proper treatment of the other members of the family the question presents more difficulties, the solution of which must depend somewhat upon circumstances. It is obviously impossible even if it were advisable to try to enforce a strict isolation, and the best that can be hoped is to evolve some plan which, while giving protection to the public, will allow a certain amount of liberty to the well members of the family. In almost every state the children of school age are excluded from school during the continuance of the disease, so that the decision does not rest with the local authorities. It is practically impossible to do much more than warn them to keep away from other children, and do our best to make them obey by frequent visits. This question is one

which requires careful consideration by heatlh boards in order that some good working rule may be formulated.

There is less trouble about the adults of the family; they can be trusted to keep watch of themselves and call for the advice of a physician if they begin to feel ill, and unless their occupation brings them in contact with children, or has to do with the handling of food stuffs, they may be allowed practical freedom of action.

The study of the cause of an outbreak of communicable disease is of the utmost importance and one which is too often neglected. Too many Boards of Health seem to consider that they have done all that is necessary when they have made a record of the case and put a warning placard on the houses where the cases occur. Such a course cannot be too strongly condemned, and each case should be carefully studied and compared with the others in order to discover the factors common to all and in that way find the cause. Isolation, disinfection and similar measures will avail little in checking an outbreak if there is some undiscovered cause at work spreading infection. It may be a case of "walking typhoid" among the employees of an outlying dairy farm; or it may be a child in the schools who has had a slight "stomach rash" which faded within twenty-four hours, that is causing the trouble, but whichever it is, all our efforts to check the outbreak will be useless until we have discovered and removed the cause. And furthermore we must not allow ourselves to be led astray by any preconceived notions of the cause of any given outbreak, but approach each one with an unbiased mind and study it carefully on its merits. We must not believe that because we have an outbreak of scarlet fever on our hands that the cause is due to an undiscovered case of scarlet fever among the school children. In one instance that came under the writer's observation there was a sudden outbreak of scarlet fever which seemed inexplicable, until finally the cause was found in a milkman employed on a dairy in a neighboring town. This man was desquamating after an attack of scarlet fever, and after his removal the outbreak ceased. One curious feature of this outbreak was that it picked out those members of the families who drank milk raw and spared those who used it boiled or pasteurized.

THE PREVENTION OF THE SPREAD OF CONTAGIOUS DISEASES, PARTICULARLY AMONG CHILDREN.*

By Dr. A. S. FELL,
Health Officer, Trenton, N. J.

The prevention of the spread of the contagious diseases that are ever with us to a greater or lesser extent, is one of the most important duties devolving upon all health authorities; one that has been widely discussed time and again and many measures adopted for the purpose of holding them in check. As we look the situation over as it presents itself to us day by day, we are impressed with the fact that there are certain factors ever entering into the question, which have a tendency to lessen the control over such diseases as all health authorities would like to exercise.

This paper must of necessity be brief and while we cannot hope to say anything that will be new on the subject, still if it should cause any discussion whatsoever, points may be brought out that will prove of very great benefit to us in our search for light as to the best means and methods to be adopted for the proper prosecution of the work in question.

Of the factors to be considered in connection with this question, one of the most important, is the risk entailed by perfectly healthy children coming in contact with a child who is in the prodromal stage of one of the acute contagious diseases such as scarlet fever, diphtheria, measles, etc. Authorities make the claim, and we believe with good reason, that this class of diseases are just as contagious during the prodromal stage as they are at any other period, therefore, if that be the case, the danger to other children during that particular stage is an ever present one and one that is hard to fight against, from the fact, as you all know that it is quite impossible at times to make an early and definite diagnosis. As a rule, children who are unwell, whether they do or do not present characteristic symptoms of any definite disease, are not isolated, but are permitted to continue mingling

* Read before the Section of Municipal Health Officers of the American Public Health Association, at Richmond, October, 1909.

with the other children in a household and also to continue at school until they are too sick to go about, or an alert teacher sends them home as a matter of precaution, not permitting them to return until they can present a certificate from their family physician that all is well.

While it is not impossible to isolate children when they first commence to complain of feeling unwell, on the principle that they may be in the prodromal stage of some contagious disease, it is rarely done, but it should be done always as a matter of precaution. If this were the rule rather than the exception, many children who now contract these diseases would almost surely escape them and the health and educational authorities would be saved much extra, unnecessary work and vexation of spirit.

Another factor we would speak of, is the known laxity of many physicians in reporting such cases promptly to the authorities. We realize as well as any one can, how almost impossible it is at times to make an early and positive diagnosis in these cases, but this does not excuse the fact, that it is the duty of every physician who is called in to see an ailing child, to isolate it immediately, unless he is in a position to make a positive diagnosis on his first visit, and then await further developments. As soon as the disease is recognized, it is the physicians duty to instruct the parents as to the precautions that should be adopted to prevent any further spread of the disease, either in their own or other households, and then immediately report the case to the health authorities, so that such steps may be taken as is necessary to checkmate the disease.

But aside from all this, some physicians fail to report these cases, even after they have made a positive diagnosis. Some do this wilfully. Some do it for fear of incurring the displeasure of certain families whom they may be particularly anxious to please; some do it because they claim, whether rightfully or wrongfully, that the law cannot compel them to do the slight work required in reporting a case, gratuitously. Some just simply fail to do it at all and without any good reason. They just neglect it.

Just here, in connection with this known laxity in reporting, we would like to quote, with your kind permission, just a

few lines from a report made last August on this subject by the Health Commissioner of Seattle, Washington, which appeals to us as being exceedingly apropos:

The Commissioner says: "Probably the most dangerous man in a community is the physician who fails to comply with the law requiring all infectious and contagious diseases to be immediately reported. This is especially true in regard to mild or suspected cases of contagious diseases which, when unreported, are extremely dangerous to the public health. Such a man, who will, knowingly, allow contagion to spread throughout the city, ought to be driven from our midst. A physician who has not the manhood to promptly report cases of this nature, on account of fear of offending a family, should have his name stricken from the roll of honorable men. A physician who knowingly allows the spread of contagion, in order that his pocketbook may fatten, deserves the most harsh treatment from the people to whom he may bring sickness or even death. We can readily understand how the ordinary layman, without an understanding of the nature of contagion or the necessity for quarantine, may feel aggrieved when the health department finds it necessary to quarantine his home for a certain length of time, but for the physician who is educated in these matters, and who is protected by the laws of the commonwealth, there is absolutely no excuse for not complying with the law."

All the commissioner says on this subject is true. All physicians do not attempt to ignore us. The great majority cooperate with us at all times and under all circumstances, but there are always some in each community who deserve to be brought to book for their persistent ignoring of laws that have been enacted for the benefit of the public health, and they should be made to realize, that they, as a matter of fact, instead of being above, are subordinate to the laws just the same as anybody else.

Another factor is that we must contend with the proverbial dislike entertained by the average parent against having his home placed under the restrictive measures which a close quarantine necessarily entails, and many times parents will adopt almost any means at their command to escape its provisions. Instead of co-operating with the health authorities

in their endeavors to control and stamp out these diseases, as all right thinking people should do of their own volition, they assume an antagonistic attitude, and this despite the campaign of education that has been waged so vigorously by the sanitary authorities in the journals and press of our land, particularly during the past decade, in the endeavor to get them to work in harmony with us. This educational effort is having its effect on the people. Slowly but surely and gaining ground each year, public sentiment is veering around to that point where each and every citizen will give the matter his hearty endorsement and support, and towards such an end we must constantly strive.

Failure by parents or others to completely isolate a case of contagious disease after it has been reported, is another factor we must contend with. When a house is placed under quarantine, that quarantine should be all that the word implies, but unfortunately, many health departments throughout the country have neither the force, equipment or financial resources that will enable them to maintain more than a merely nominal quarantine, and this must in most cases be only partially effective. When a house is under quarantine, in addition to the instructions issued by the family physician, we also instruct them as to what they must and must not do, giving them all the necessary information as to the precautions that must be exercised, and yet with all this, some of them fail to isolate the patient in a room far removed from all the other inmates of the house and in addition they permit all the others in the house to come in contact with the patient. The mother, who is generally the nurse, comes and goes from the sick-room as she pleases, attending to the other duties devolving upon her and without taking such precautions as she has been specifically directed to do. In some instances, like a very mild case of scarlet fever for example, the patient apparently fully recovers from the attack within a day or two after they have been stricken, the eruption rapidly disappears, and then instead of being kept isolated until the desquamation has made its appearance and run its course, patients are often permitted the freedom of their homes and perhaps the surrounding neighborhood, to the later sorrow of other people whose children are attacked by the disease, and yet people wonder why these contagious diseases keep on appearing. We of course

realize that this condition could only occur in those localities where a health department exercises what we have before mentioned as a merely nominal quarantine, either because of a don't care policy or else from lack of a necessary force and equipment to carry out a quarantine that would be wholly effective. In the latter case quarantine could readily be made all that the word implies.

Many children complain of not being well and yet present no definite or distinctive symptoms, in fact a layman probably wouldn't recognize them if they did, and these are the cases that are sent away to school under an impression by the parents, that the ailment is merely a temporary one brought about probably by some internal disturbance, which a dose of castor oil or nitre will clear up speedily. Many children we know are prone to complain to their parents that they are not well, simply as an excuse to stay away from school and we need not wonder that doting mothers are often deceived and insist upon an ailing child continuing at school on general principles. A day or two elapses and the child is too sick to get out of bed; the family physician is called hurriedly; pronounces the case one of scarlet fever, diphtheria, or some like contagious disease; the health department is notified; quarantine instituted, and the teacher receives a message over the telephone to the effect that the child is down with a contagious disease. The other children are immediately dismissed for the day and the room or rooms fumigated thoroughly. The teacher then breathes freely, thinking in many cases that all danger from the case is past, whereas many times such is far from being the case, the disease microorganisms have already secured a foothold on new and fertile ground, and instead of the trouble being over, it has only just begun, all due to the parents lack of appreciation of the fact that possibly the child was developing some contagious disease and should have been kept at home and isolated from the very beginning on general principles. Possibly too much blame should not attach to the parents for such a condition. They cannot well be expected to recognize a contagious disease in the incipient stage, that is hard for anyone to do, but still we think it advisable to impress upon the lay mind at every opportunity, the necessity for exercising extreme caution always.

Of the many sources of infection with which we must contend, one of the most prolific to our minds are the schools, state, public, private and parochial. We believe that all health authorities agree that the schools are the main distributing stations for the contagious diseases peculiar to children. During the summer vacation period, this class of diseases drops to practically nothing, but just as soon as the schools reopen in the Fall, reports of these diseases commence to come into the health department and despite the activities of the health and educational authorities to stamp them out, they continue throughout the school year, showing merely periodical aggravations and declines as the weeks pass by.

One of the pressing needs of all municipalities, (many have it already), is a system of daily medical inspection of all school children, if we expect to be able to exercise any efficient control of the contagious disease situation. Trenton is only just waking up to this great need and her eyes are not yet fully open. Our Board of Health has tried several times in the past few years, by recommendation to the governing body of of the city, to secure such systematic inspection as we believe all live cities should have if they wish to keep abreast of the times. We believe this to be the basis for any work instituted, having for its object a betterment of existing conditions. We do not believe these acute contagious diseases can ever be wholly eliminated. They, like the poor, will be ever with us until the millenium arrives, but keeping them down to a minimum figure at all times we believe to be entirely feasible, providing proper measures are instituted and then faithfully and persistently carried out. School inspection is one of the great levers by which this may be brought about. It won't be long before such an inspection will be demanded as a right by citizens and when it does come, the wonder will be as to why it was not started long before.

The question of the control of the acute contagious diseases and the medical inspection of school children are so closely co-related, that it is almost impossible to write about the one without bringing in the other. This is our only excuse for touching upon the subject at all, and if you gentlemen will permit the digression for a few moments, we would like to state briefly, just

a few words on the school inspection in our city, so that if similar work in other cities is brought out at this meeting, we may be the better able to compare it.

For the first time in its history, medical inspection of public school children in the city of Trenton, was instituted on January first of this year. This service is one that has been recommended to the controlling municipal body, by the Board of Health, several times during the past few years. The question of whose control it should be under is of course a mooted one. In Trenton it is controlled entirely by the Board of Education, the Board of Health has absolutely nothing to say about it. The service as outlined and thus far carried out, we feel will prove inadequate to the needs of the city. It has already met with some criticism and even while this paper is being written, the Board of Education has the matter under consideration.

We now have a population closely approximating 100,000 people. There are thirty-one public schools with an attendance of about 12,000 children, aside from fourteen Catholic and numerous private schools which do not come under the provisions of this inspection. A comparatively small amount was appropriated to pay the expenses of the inspection during the current year. This being the first year of the work, it must of necessity be largely in the nature of an experiment, and probably too much should not be expected from it. Six young physicians were appointed to act as medical inspectors, at an annual salary of $200.00 each, and the public schools were divided between them as nearly equal as possible. They will each have in the neighborhood of 2,000 children under their supervision. These inspectors are young men on the very threshold of their medical careers. They are at work building up a private practice upon which they and their families must depend in the future. When this inspection was first started, it was the intention to have them devote the hours between nine and twelve each day to this work. These are the choicest hours of the day to a physician in general practice and we cannot blame these inspectors if they refused to give them up to this work. We believe this rule has been modified to such an extent, that the inspectors are only required to visit each school once a week and at other times to be under call. Under the first ruling, the work they were

asked to do was too great and the compensation allotted too small to warrant the giving of the time. Under the later ruling, we feel sure the service will prove to be unsatisfactory to both parties. As we have before stated, it is already being criticized. If the first ruling could have been carried out, the work would have been of incalcuable benefit to the health department in its efforts to control and prevent the spread of these acute contagious diseases, but as it is carried on at present, we feel it will not be of much benefit to us. Fortunately the corps of teachers in our public schools are ever on the alert for symptoms of illness however slight, among their charges and they do not hesitate an instant in excluding from school any child who appears to be in the slightest degree unwell, and furthermore, they are not permitted to return without presenting a certificate, either from their family physician or from the health officer. This constant watchfulness on the part of the teachers has helped us greatly in our work and we cannot commend them too highly for their endeavors to assist us at all times.

Our health department, like many others in this country at present, is badly handicapped in the prosecution of its work on contagious disease lines as it is on all other lines of work it is called upon to do, owing to the lack of a sufficient force of men, equipment and appropriation. In a city like ours, having a population of 100,000, the health officer should by all means be in such a position as would enable him to devote his whole time to the work, but the salary is insufficient and the tenure of office too uncertain to warrant his devoting more than a certain portion of each day's time to the work. The entire force for health work consists of the health office and two sanitary inspectors, the latter two being laymen, so that you can readily understand that to do all the work as outlined by the sanitary code, is a proposition that would tax the energies of more than three men. It is beyond the range of possibility to do the work as it really should be done, but we do the very best we can under the circumstances.

In the handling of contagious disease cases, aside from smallpox, we receive no assistance from the police department as they do in many cities in maintaining quarantine. The hiring of private guards is expensive, unsatisfactory and the appropria-

tion will not warrant it, hence we are compelled by necessity to exercise a merely nominal quarantine, consisting solely of placarding houses; instructing the inmates as to what precautions should be observed and finally when the patient is pronounced well, fumigate the premises.

What is necessary to keep the number of acute contagious diseases in a city down to the minimum at all times?

"A health department more than any other one department of a city government should be thoroughly equipped in every particular. It should not be hampered by an insufficient appropriation. Money should be a secondary consideration when a department is to be held responsible for the preservation of the public health. There should be an equipment and force large enough to cope with all the work there might be to do and do it right. All employees should be paid enough to warrant the devotion of their entire time to the work and the tenure of office should be made more secure. Under these conditions alone can the work be made satisfactory to all concerned."

"All cases of infectious and contagious disease, when reported, should be immediately investigated by the health officer or medical assistants and the cases should be under their daily supervision until the quarantine is removed."

"There should be a thorough system of medical inspection of all the school children in the city, state, public, private and parochial."

"All physicians failing to comply with the laws and ordinances of the Board of Health requiring the reporting of all infectious and contagious diseases and filing certificates with the Bureau of Vital Statistics should be prosecuted without fear or favor."

"The campaign along the line of educating the laity on sanitary matters should be prosecuted even more vigorously, if possible, in the future than has been done in the past, so that they may speedily be brought to a realization of the necessity for co-operating with us."

"Every city should have a thoroughly equipped municipal hospital. It should be open all the time and in charge of a competent staff of physicians and nurses, so that these cases could be removed without delay whenever necessary."

"Last, but far from being the least of the preventive measures, we should place forcible hospitalization. This we believe would prove to be the most important of the lot if it could be carried out in all cases of contagious disease, no matter what the character."

This last proposition would undoubtedly raise a storm of opposition in many quarters. Many parents would be unwilling to have their children or other near relatives removed to a municipal hospital, no matter how good the environment might be, but as a method of protecting the general public health it would prove to be invaluable. We follow this method with all of our cases of smallpox and seldom encounter any opposition, all due to the fact, that public sentiment has been educated to such a degree, that the patients and their relatives realize that it is the only proper thing to do. They appreciate the fact that to save their fellowman they must sacrifice themselves.

If this can be done with smallpox cases, why not with all cases of contagious disease? It is only a matter of education and we believe most people could be readily convinced of the necessity for it if it was presented in the proper light. There can be no question but that it would save untold suffering and needless expense.

PRELIMINARY REPORT ON THE TUBERCULIN TEST AS APPLIED TO A CITY'S MILK SUPPLY.*

By GEORGE W. GOLER, M. D.,
Rochester, N. Y.

The object of this paper is to present a simple plan for the examination of a city's milk supply to determine its measurable infection or freedom from infection with tubercle bacilli. Anderson, in the Journal of Infectious Diseases of March, 1908, shows the result of his work in the city of Washington, D. C., where in an examination of 223 samples of market milk, 15 samples or 6.72 per cent. contained tubercle bacilli in sufficient numbers to cause typical tuberculosis in guinea pigs after six weeks.

Hess† in New York, has submitted 107 specimens of the "loose milk" of stores to the physiological test, and found that 16% of his animals were infected by the tubercle bacillus. Read his paper, for he has given a most valuable resume of follow-up work in tracing the hygiene, sanitation, and tuberculous infection of the children of storekeepers who drank the milk, and became tuberculous.

The reason for determining the absence of tubercle bacilli from the market milk of cities is not altogether that the supply of market milk be drawn from herds free from the power of transmitting tuberculous infection to other cattle, and thus prolonging the lives of tuberculous herds; but that we may also be reasonably sure that the tubercle bacillus may not be carried to milk, and thus act as an infective agent in causing tuberculosis among our children. For whatever part we may take in the controversy concerning the infective power of the bacillus of bovine tuberculosis for men and women, we cannot cast aside the experimental proof of such observers as Schroeder, W. H. Park, Hess, whose work goes far toward proving that milk infected with the bovine type of the tubercle bacillus is a factor in causing tuberculosis in infants.

* Read before the Section on Municipal Health Officers, American Public Health Association at Richmond, Va., October, 1909.

† Hess. Tuberculosis in Milk, Journal American Med. Assn., Mar. 27, 1909.

W. H. Park shows as a result of 58 autopsies in infants dying of tuberculosis that in 20% the bovine type of the tubercle bacillus was recovered. It having been proven that the bovine type of the tubercle bacillus does cause disease and death in children, what are we as sanitarians to do in the matter? It is not sufficient that we devote our attention to establishing and conducting sanatoria, day and night camps, schools and classes, and preaching the doctrine of open air, rest and all the other means for the treatment of consumption that modern curative medicine has developed in the last few years; for we are dealing with a disease whose ravages are due to the stress of modern civilization. What does it matter even if we preach and work against city congestion, the bad sanitation of a city, induced by bad street car service, high street car fares, and the high rents which make city congestion possible in the tenement and in the block. We may talk and work against bad municipal housekeeping, smoke, dust, impure air and water, bad school hygiene, impure food, and all that goes to make municipal life less worth living, but if we still permit direct tuberculous infection to take place through the ingestion of infected milk, our work is done but in part. The municipality that permits milk infected with the tubercle bacillus to be fed to its children, does not provide that protection which it is bound to give them. It is not only that the city loses those who die, but it suffers through those whose resistance is sufficient to enable them to live, and thus become less efficient members of society. It is not the dead, but the half dead, who are a menace to society. The city that neglects to protect its children against milk infection with the tubercle bacillus aids the men who furnished this milk in continuing the life of infected herds and delays the day when the measurably infected herd shall be stamped out. For the dairyman who holds even one infected cow in his herd, not only maintains a cow whose life is a menace to the health of the municipality to whom he furnishes milk, but one whose milk producing capacity if not lowered immediately, is ultimately lowered because of her shortened life. The tuberculous cow is therefore a loss to her owner, and a menace to the health and lives of the children of the State.

This plan for determining the condition of the milk supply of a city is based upon the work of Anderson of Washington. It

differs only slightly in detail, and is so arranged that it may be carried out by even the smaller municipalities, or where men may not be obtained familiar with all the details of modern laboratory technique.

In our work samples are collected from the retailer in original packages and numbered serially. From a pint or quart bottle of milk, or when the retailer does not bottle his milk, a pint of milk is collected in a sterile bottle and taken to the laboratory. Fifty c. c. of milk is mixed with 50 c. c. of sterile distilled water, put in a conical glass and centrifuged for an hour at two thousand revolutions per minute. Our centrifuge has four arms, and thus four samples are worked up at the same time. Eight half grown pigs are used, two for each milk sample. The glass containing the sample of milk is taken from the centrifuge and a sterile platinum dish used to remove the layer of cream which is mixed with enough of the top milk to make it sufficiently fluid to pass through a good sized hypodermic needle. Five c. c. of the mixture is injected beneath the skin in the groin of one guinea pig; then all but 5 c. c. of the remainder of the milk is decanted from the glass, the sediment well stirred with a sterile platinum loop, and the 5 c. c. sediment mixture injected into the second pig. A similar procedure is carried out with the remaining animals, when they are charted according to color and markings and confined in open pens, four to eight in each pen. At the end of four weeks they are examined for enlarged inguinal glands and any other changes that may be present. At the end of six weeks they are killed, subjected to autopsy, and the macroscopical, but not the microscopical condition of the glands and viscera noted and recorded. Before working up the samples of milk each specimen is chemically examined and "counted," the animals dying of acute infection, amounting to 17% thus far, in our cases, are to be replaced by other animals subjected to like treatment from samples obtained from the same dealer.

When an animal is proven to have the well marked naked eye lesions of tuberculosis, as shown by autopsy, smears are made and the presence of the tubercle bacillus proven in this way. The name of the retail dealer from whom the milk was taken is obtained; he is asked to come to the Health Office, where the name of his producer or producers have already been taken from

the records. He is shown the animal and the lesions; and the manner of their production is explained to him, and he is told that one week will be given him to have the herds from which he obtains milk tuberculin tested; otherwise the milk will be excluded from the city. He is further told that he may go with the milk inspector, who will take the preserved viscera and show them to his producer. If the retailer agrees to go with the milk inspector to visit his producer, well and good; if not, the inspector goes alone to the producer, shows him the specimens from the infected guinea pigs and explains the necessity for having his herd tuberculin tested. If the producer agrees to have his herd tested, a form is given him from the State Department of Agriculture, which he is asked to sign. In New York State, the State Department of Agriculture agrees to test the herd, pay 80% of the appraised value of the animals that react and show localized lesions, 50% of the value of those with marked and more general infection. The test under the New York State law is made by a State veterinarian, and is without cost to the owner.

Since January, 1909, 50% of the retail dealers in Rochester have had their milk subjected to the physiological test by having guinea pigs injected with it. Out of eighty retailers whose milk has been tested, samples from five of them, selling approximately 2,000 quarts of milk from six producers having a hundred and eighty cows, have shown in the reacting animals marked naked eye evidences of tuberculosis. Of these producers, two, owning ten and fourteen cows respectively, refused the test, and the milk was excluded from the city. Four producers, owning one hundred and fifty-six cows, had their herds tested, and seventy of the cows reacted; twenty-seven of them had the disease disseminated, and their bodies were tanked for phosphate.

The City of Rochester has a population of more than 200,000 people. Approximately eighty thousand quarts of milk are used daily. On a rough physiological test of slightly less than half the market milk, 2,000 quarts, or 5% of the output is found infected, and this by using a test that depends only upon lesions that are apparent to the naked eye. If the microscopical lesions had been determined and used to exact the tuberculin test from the retailer and producer, or if the animals had been allowed to

live longer, or the infection of the guinea pigs had been determined by the injection of tuberculin as advised by Anderson, a much larger number of reacting animals, and therefore, more infected herds would have been found. But one of the important points in our application of this test in the preliminary work is that we present only naked eye evidences of tuberculosis to the retailer and to the producer that they can understand. Men engaged in the sale and production of milk are sufficiently well acquainted with the appearance of the viscera of animals in health to be able to note such marked departures from health as are shown in the bodies of guinea pigs when markedly affected by tuberculosis. The exhibition of such animals convinces the milkman every time. Microscopical evidences of the disease, no matter how plain to those conversant with laboratory technique, are not at present sufficient proof for the milk dealer or producer. When we have weeded out the markedly tuberculous animals from the herd that give early and naked eye evidences of tuberculosis, we may then attack the other end of the problem.

Another important point in this work as done by us is this: We hold the retailer responsible for the freedom of his milk from tubercular infection. If he buys milk that is infected, we give him a few days in which to see that his producer has his herd tested. If the herds are not tested, we exclude the milk from the city, and notify the Department of Agriculture. This is a simple plan by which any city may provide for the application of the tuberculin test to the cattle that supply it with milk.

Already as a result of this work notices have been sent to the State Department of Agriculture for the application of the tuberculin test to a number of herds which have not been shown to be tuberculous by our test. The farmer has been thus stimulated to apply for the tuberculin test himself. He sees the importance of saving his herd. We see the value of keeping our children from such tuberculous infection. How many cities will join in the work?

We have enlisted the aid of all people in the general campaign against tuberculosis. Shall the main work of this campaign be directed toward the building of sanatoria and other establishments for all manner of cases, for work with the disease, while the bad sanitation of city life, and the neglect of personal hygiene,

make the disease faster than all the institutions now provided or in course of erection can take care of it, or shall we as sanitarians direct the attention of men and women to the places at which the disease is in the making? If we are to accept the statements of Park and others, the bovine type of the tubercle bacillus is responsible for much tuberculosis, especially the glandular and abdominal types in the child. Shall we not do our mite in the campaign against tuberculosis by freeing from infection the herds that supply our cities with milk?

THE CLEAN MILK CAMPAIGN IN HAMILTON.*

By GERALDINE STEINMETZ,

From Data Supplied by Dr. James Roberts, M. O. H., Hamilton, Ont.

The initial step in Canada in securing a clean municipal milk supply was undertaken in Hamilton this summer. The point at which it began was the imperative necessity of having clean, fresh milk for bottle-fed infants during the summer months. This was secured, the expected results naturally following.

The previous state of the milk supply, as it is practically to-day in Hamilton and in all Canadian Municipalities, was controlled by a regulation regarding butter-fat and by a more or less thorough supervision of the stables, which prevented any extreme filthy conditions. Sterilization, that degree of cleanliness which is the only effective degree, was unknown in the premises of the milk-producers.

The credit for the idea and the inspiration for the clean milk campaign for babies in Hamilton, is due to Dr. Goler of Rochester. With his work in mind and his example closely to follow, the work in Hamilton was begun and maintained. Early in the spring, when the Rochester plant was not yet open, Dr. Goler personally explained his system of milk-control to a deputation from Hamilton which cannot sufficiently thank him for his courtesy and attention. Dr. Goler's unremitting efforts in Rochester are meeting with their due reward and recognition and Public Health Authorities all over the continent pay him the sincere compliment of imitation.

Any reform with regard to public health needs two supports; money and public opinion. As in most other places, the latter has to be created, and the former, always lacking, has to be begged.

When the project was proposed by the Medical Health Officer, Dr. James Roberts, to the Board of Health, it met with their heartiest approval, but the Board advised that the co-operation of the Medical Society of the city be obtained. This step, though necessary on account of the circumstances and lack of money,

* Read before the Section of Municipal Health Officers, American Public Health Association at Richmond, Va., October, 1909.

was not the most beneficial to the plan. One man can always con-control a new movement better than six. After passing by two meetings of the Society when the attendance did not justify its introduction, at the third meeting the subject was given a cold reception and formal endorsation. It was hoped that physicians would prescribe the pure milk and thus help to create a demand.

The Board of Health could not, from its small appropriation, allot the sum, $500.00, necessary to carry it through. The city council was appealed to. Ladies, interested in such reform work, took the matter up and convinced the council that it was a scheme which met with their approval. The result was a grant of $100.00.

Just here you will, perhaps, pardon a digression on the occasional (!) lack of correspondence between the amounts of annual city grants and the purposes to which they are put. Two volunteer regiments get $250.00 each; a poultry association $50! The Bowlers' Club $250.00! the Clean Milk for Babies, $100.00! Nor is this the only occasion upon which money imperatively needed for the protection of public health has been refused. In 1908 a by-law was passed for the issuing of debentures for a $75,000.00 isolation hospital for contagious diseases. But the officials whose duty it was to carry out the wishes of the citizens, instead of forwarding, prevented, by intrigue and wire pulling, the carrying out of the plan. The result has been that for lack of proper hospital accommodation an epidemic of scarlet fever, almost uncontrollable, has held sway for two years, and is only now dying out. $75,000.00 would hardly be a high enough value to place upon the life, health and work lost and the inconvenience suffered through this illegal proceeding.

To return to the milk question. The executive part of the work was left to a Milk Commission, composed of members from the Board of Health and the Medical Association. Taking in hand the $100.00 grant, they obtained the balance needed as a loan from a local bank at 4%, making themselves personally responsible for its payment if private subscription did not complete the amount needed.

The press of the city wrote the work into popular discussion and approval. Headlines displayed the fact that 100 infants had died in the summer of 1908, from intestinal diseases

originating, in all probability, from unclean milk. It was expected that the death rate would be cut in half. The Victorian Order of Nurses, a charitable organization, took charge of the two distributing depots in the city. Public opinion was educated up to the point where it was considered that milk, clean and fresh from the cow, was not a mere luxury but an absolute necessity for infants, and a most desirable thing for adults.

The producer, whose milk was contracted for by the Milk Commission, has always made a point of producing milk under clean conditions and selling it directly to the consumer. He owns fifty acres and a small herd a few miles from the city. Milk was to be supplied by him to the nurses at the farm at 6c a quart for 25 quarts per day, and 7c for any amount over the 25 quarts. After it had been properly diluted by them with sugar solution and bottled, the milk producer delivered it to the depots in the city. The milk was contracted for from July 21st to September 18th.

The following is a brief outline of the mode of operation, which is already familiar to those who have read Dr. Goler's pamphlets:—

The chief points to be observed to get clean milk are to have healthy cows, sterilized pails and bottles, a clean stable, clean methods of milking, and immediate cooling of the milk. The cows at this farm have been tuberculin-tested and are free from disease. After the pails and bottles are washed, they are sterilized by placing them in a large wooden box and subjecting them to live steam from a boiler for an hour.

The stable is whitewashed and has screened windows to keep out the flies. The door by which the cows enter is hung with canvas strips which brush the flies from the cows' backs. The floor is of concrete, well-drained and is kept perfectly clean.

The milkers wear loose, sterilized, white gowns over their ordinary clothes and wash their hands before milking. The cows' udders are also washed. A marked improvement on old fashioned milking methods is the covered pail. The ordinary open pail admits dust and germs from the air. Covered pails with openings at the top 4 inches in diameter are used and are covered with sterilized absorbent cotton between cheesecloth.

As soon as each pail is filled it is taken to a separate milk

room 100 feet from the barn and set on ice. This immediate removal from the stable and sudden chilling is very important. The low temperature prevents the growth of bacteria and must be maintained. To the milk intended for the babies is added a solution of sugar and water to make it more fit for their use. This is done by the nurses in the shacks erected for the purpose.

The shacks and equipment cost approximately $500.00. The salary and expenses for the nurses and their assistant, with additional charges, increased the total cost to about $1,000.00. Next year, after the experiences of this summer, the total cost to the city should only be about $500.00 if the Board of Health controls the expenditure.

The outcome of this work was the sale of 3,377 quarts of clean milk containing the sugar solution. Two hundred and seventy-three babies were fed on this milk.

The direct results were as follows: Of these 273 babies, 13 died, but of the thirteen, six were moribund at the start. The comparison of the death rate for 1908 and 1909 shows an encouraging decrease. The infant death rate in July, 1908 was 30, in July, 1909, 29; in August, 1908, was 67, in August, 1909, 49; in September, 1908, 55, in September, 1909, 37. The fact that there is not a 50% decrease in the death rate is not due to the fact that the premise was incorrect but to these facts:

1. That the summer was unduly trying.
2. That not all infants were fed on this milk.
3. That a longer period of time is needed before definite and proven statistical results can be obtained. The doctors who prescribed the clean milk are very gratified with the results in particular cases.

The indirect results are much greater. All over Ontario much interest has been taken in the movement and both periodical and daily press have given much space to the question of clean milk.

In Hamilton the interest aroused will be directed to the passing of regulations relating to the testing of cows for disease, sanitary methods of milking and the keeping and distribution of milk at a low temperature. A city of only 70,000, like Hamilton, is not too large for effective control of the milk supply and it is expected that persistent effort will attain the results desired.

Section on Vital Statistics

THE IMPORTANCE OF POPULATION VITAL STATISTICS AND THEIR TREATMENT ACTUARIALLY.

By MILES M. DAWSON, F. I. A., F. A. S.,
Consulting Actuary of Bureau of the Census.

It is perhaps unnecessary really to expatiate before the members of this Association upon the manifest advantages of correct vital statistics. The reduction of the death rates, as well as the maintenance of the living in a good state of health, is precisely the purpose and object of this Association, and it is obvious without discussion that statistics which do not mislead, but instead, correctly represent the conditions actually existing, are of the first importance, because in no other way is it possible to know whether the progressive improvement which is aimed at is being accomplished or not. This is not merely true, likewise, of the death rate as a whole, but also as to the deaths resulting from certain diseases or other causes.

The vital statistics which are usually supplied, as the result of the returns of deaths only, are, when compared with statistics of other communities, apt to be somewhat misleading. Thus, for instance, when ratios of the same to the estimated population of the city or other district are deduced, it may appear that there is a lower or higher death rate as compared with some other city or district. Yet the figures may be wholly misleading because the distribution of the population at the different ages is not the same. As a case in point, if one of these communities is constantly receiving a large number of additions to its population by immigration, and the other perhaps is losing by emigration, the first being a relatively new community, and the second an old and well settled community, there will be a great disproportion of persons in the higher ages, in the latter community. Among these, no matter how good the stock may be from the

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standpoint of vitality and no matter how healthy the district and how excellent the sanitation and the personal hygiene, the mortality will be high, and the ratio of the deaths to the total population will be greatly influenced thereby. In fact, the better the stock from the standpoint of vitality, and the more favorable the conditions from longevity, the more persons there will be at the higher ages, where the death rate is inevitably high, and, therefore, possibly, though not necessarily, the higher the general death rate.

Undoubtedly, information of the same type relating to the proportion of the total deaths due to particular diseases or other causes, is of greater value; but even in these regards it needs to be taken into account that the amount of improvement which is possible in the matter of longevity, is limited. It is possible to cause more people to attain old age, but it is not possible to extend very greatly the extreme duration of human life. In other words, if more thousands of people, for instance, are brought safely up to the age of 70, it merely means that so many more out of that generation must die, in the nature of things, within the succeeding thirty years. This affects not merely the general death rate, but also the rates for deaths due to various diseases and other causes. The diseases which carry off the old will in such a population appear in excess of the averages elsewhere, while the diseases which are peculiarly fatal to the young and the middle aged will appear in smaller ratios than elsewhere, as causes of death.

Thus, for instance, diseases of the circulation and of the kidneys must be expected to appear more frequently as causes of death in the general mortality returns when a larger proportion of the inhabitants escape being victims of disease or accident in youth and middle age and attain to old age.

The foregoing is presented, not with any notion that it is a complete or even a comprehensive statement, but merely in order that it may appear that vital statistics which do not distinguish as to the mortality at different ages are defective, as a reliable guide, either in determining the true death rates in a community or in determining whether there has been an improvement in the vitality conditions, on the whole. This has long been recognized by the actuarial profession and by

statisticians who have given the subject consideration; but the difficulties of assembling information which enable the facts clearly to appear concerning the mortality rates for different ages and concerning accounting for the deaths at the different ages according to cause, are exceedingly great.

The most important difficulty, of course, has been to obtain accurate or even reasonably accurate information concerning the deaths, exhibiting the occupation, the age and the cause of death. The various states and cities which have introduced and maintained an adequate system of registration have been grappling with this problem for many years. It cannot be said that they have been entirely successful but throughout a large part of the country, from the standpoint of population now embracing more than half of the entire country, there is now in use under proper regulations for its enforcement, a system of registration which, it is believed, is giving reasonably uniform and reliable results.

The question is now before this Association for consideration, I am informed, what changes in the standard form of registration certificate might at this time well be adopted. Before addressing myself to that topic, I am disposed to report the metrical form of death certificate, which is said to have been indulged in by a certain wag among the doctors:

"Regarding William Shore
We'll never see him more,
For what he took for H_2O
Was H_2SO_4."

That is, instead of water, sulphuric acid.

It is a far cry from the early state of registration to the present comparatively perfected form; but there is even now only too great a disposition in some quarters to feel toward it as this physician may conceivably have felt, viz.: that it is a great joke at best, and sometimes an imposition. In some parts of the country there are even members and sometimes very prominent members of the medical profession, I am told, who cannot bring themselves to see that it is only by holding the physicians and the undertakers strictly accountable, that the vital statistics of a community, city, state or nation can be made of real value and utility.

The present standard form, especially with the amendments which have already been suggested and canvassed, and particularly the amendment requiring the nature of the industry in which one is employed to be stated, as well as the nature of his employment therein, seems to be pretty nearly all that will be necessary to cause the vital statistics of registration districts which are now furnished constantly to the permanent bureau of the census, to be of the highest significance.

The sole item of additional information which I venture to suggest is that the question could be improved by changing the question "occupation" to "last occupation" or perhaps better "latest occupation," or it might be better to leave the questions as suggested by others, and add "if retired, state last occupation."

It is of particular importance that the precise nature of these questions be now determined and agreed upon after full discussion and consideration, because—and this is another phase of the matter which falls to me to discuss—it is not sufficient that we merely have the information which is afforded by the registration of deaths. We must also have information as to the number of lives exposed at the different ages and in the different occupations, and this information can be obtained only by enumerations, such as are undertaken in the census and one of which is to be undertaken early next year. It goes without saying that we cannot have a death-rate when we merely know how many have died. We must also know how many have been exposed to the risk of dying, for the death rate is found by dividing the number of deaths by the number who were so exposed.

Where it is possible, as in an analysis and investigation of the mortality statistics of life insurance companies, to follow each individual from the time he is admitted until the present time or until he ceases to be a member either by reason of death or discontinuance of his policy, the process furnishes the exposures for each age of life, and when the number of deaths at each age are divided by these exposures, we have a death-rate, exhibiting accurately the experience of the company.

Obviously, it is not possible, in connection with population statistics, to follow the individual lives thus closely. What is possible, however, may be illustrated as follows:

Suppose that an enumeration were taken of the population of a community, where the number is stable from year to year, on June 30th of a given year, and that this enumeration exhibited the number by sexes, occupations and ages. Suppose, also, that a correct registration were duly maintained. It is manifest that we would know in such case the average number of lives exposed during the year at each age, by sex, and occupation, and we would also know from the registration, the number of deaths during the year at each age by sex and occupation. It is also clear that if a registration of causes of death has been made that can be depended upon, we will also be able to account for the mortality by causes, and this in connection with every age, each sex and each occupation. This is fundamentally the method by which a correct computation of the population death rates must be made. Some modification of it may be necessary in various cases and indeed must be necessary, but this principle with only such modifications as are unavoidable, should be followed.

An important modification is one which will enable the mortality statistics of more than a single year to be utilized, even though the enumeration is only taken at decennial periods. One way in which, for instance, the mortality statistics of the year before the enumeration was taken, and the year after it is taken, may be utilized, is to treat the number of lives exposed for the three years as three times the number found by the enumeration, that is, to deal with the matter on the basis that the same number of lives were exposed the previous year and will be exposed the next year. This will be found to be approximately true, even though the population be increasing or diminishing, for the reason that the defect on one side merely compensates for the over-plus on the other, approximately.

Another important modification is by starting with the enumeration of a previous census, and by a system of what we actuaries call interpolation, arriving by a mathematical calculation at the approximate numbers exposed during each year of the decennium. In this manner we may add together the exposures for each of the ten years, and may then make use of the mortality statistics of a full period of ten years. It was by this method that the early mortality tables, published by the British govern-

ment in the course of its censuses, were constructed; and it is still employed, though the necessity for it is perhaps not so great in view of the greater reliability of the statistics which are nowadays collected, and the large number of exposures, both of which tend to make the mortality statistics of three years answer the purpose. An analysis, notwithstanding, of the mortality during each of the ten years previous, is frequently of great importance, particularly in reference to exhibiting what effect epidemics or unfavorable weather conditions may have had upon the death rates.

It is only during the last ten years that there has been a permanent bureau of the census, collecting mortality statistics and putting itself in position to furnish reliable and significant information. The twelfth census, that of 1900, could make but a limited use of this information, both because the registration areas were much smaller than at present and also because the statistics covered only a brief period. To this was added a further difficulty that the director of the census was required to have the completed results published by a certain date, which allowed altogether too short a period for a thorough analysis and presentation of the vital statistics to be completed.

The bureau of the census has during the last ten years assisted to bring about the adoption of a standard form of death registration, and, to a very large degree, of standard methods of enforcement of registration, as well as to extend the territory within which such registration is now required; and it has kept in close touch with all the means of registration, with the result that there is a large mass of reliable information as to the mortality in these districts arranged by sex, age, occupation and cause of death. It will, therefore, be possible to present statistics of the highest value and significance after the enumeration for the 13th census shall have been completed next year. The practical uses to which this information may be put are manifold. The first that will occur to physicians and all others who are interested in the public health is to encourage prevention and the early diagnosis and treatment of disease. Undoubtedly, there is a great incentive to improvement in this regard, both when the showing is bad and when the showing is good. For if it is bad, that means that it is not good as compared with some other

neighborhood or occupation, and this calls for efforts to improve the condition. On the other hand, if it is good this means that much has been accomplished in these respects, and that more may be accomplished if proper efforts are put forth.

As an illustration, the following may be noted: In the United States the statistics of the Inter-State Commerce Commission show the mortality among locomotive engineers and firemen, from the cause of accident alone, to be very much higher than the average mortality from all causes should be for men at their ages. While the death rate among employes of this class was never so high in Great Britain as in this country, it was very materially higher there than the general death rate for many years; but the last census of Great Britain showed that conditions had been so improved that the mortality among these employes was actually lower than the average for the general population, although the latter was also a great improvement as compared with the next previous census.

Another use of the material is to furnish reliable information to insurance companies and societies, thus enabling them to avoid either assuming risks at rates of premiums which will be ruinous to them, or charging extravagant rates of premium. They are most likely to make their premiums heavy whenever they are in ignorance. This is particularly true in connection with employers' liability insurance which is daily becoming more important, in view of the extension of the benefits under the employers' liability laws. Already, for instance, the idea of workmen's compensation, entitling the employe in event of disabling accident or his dependents in event of his death by accident, to recover from the employer, as a matter of course, if the accident happened while he was at work, has found lodgment on our continent, a statute of that nature having been adopted by the legislature of the province of Quebec, at its last session, to take effect on January 1st, 1910; and there are no less than four state committees or commissions now at work upon similar projects to be reported to the legislatures at their next sessions. Anything, therefore, which can be done in connection with the present census to supply employers with information which will prevent their being imposed upon in the matter of rates of premium and insurance companies and societies with information

which will enable them to fix such rates of premiums that they will be able to carry out their contracts, certainly should be welcome.

The life insurance companies of the country, also, are at the present time employed in extending the operation of their "specialized mortality investigation" beyond the experience which was tabulated some seven years ago, both with a view to bringing it down to date and testing it by comparison with more recent experience and also with a view to investigating other classes than those which were embraced in the original investigation. The work which has already been done in this regard has been exceedingly useful; but as was pointed out in the investigation itself, its significance is necessarily limited by the following fact, viz.: that for the most part, when these companies have accepted lives which are exposed to unusual hazard, they have exercised the greatest possible discrimination, selecting only the very best lives of the class. In consequence, it is not probable that these tables could be relied upon as exponents of the true mortality of the class. Knowledge of this fact, likewise, renders the companies peculiarly cautious about the acceptance of lives; and although the experience of the last seven years is doubtless broader, it is undeniable that if there were at hand reliable mortality statistics arranged according to sexes, occupations, ages and causes of diseases, there would be a disposition on the part of these companies to offer insurance at safe and moderate rates of premiums to all applicants of each of these classes.

There is also on foot at the present time an investigation of the mortality experience of fraternal beneficiary societies, and, while it will not be possible to get all of this arranged so as to exhibit the mortality according to occupation, it is expected that a large portion of it will be analyzed on that basis. There will be certain advantages in connection with this investigation, over the investigation of the experience of the regular companies, owing to the fact that some of the fraternal societies have been organized especially for the purpose of insuring persons who are engaged in comparatively hazardous occupations and frequently because insurance at reasonable rates of premiums could not be attained by them elsewhere. Moreover, many of the other fraternal societies have admitted persons who are engaged in occu-

pations deemed hazardous much more freely than the regular life insurance companies. Notwithstanding this, the information obtained by means of such an investigation, while highly valuable, will not have the same importance and significance as the results of a general mortality investigation conducted in connection with the census.

One reason why this is true of both the investigations last referred to, is that they will merely show the mortality among persons who were, when admitted, of a certain occupation, and will not, therefore, clearly and fully show the mortality of that occupation, because, unquestionably, many of them have gone into other employments long before their decease, and many of those who are still living are not in the original employment at all. It is important to the insurance companies to know how persons died who were at the time they were admitted engaged in a certain occupation, because, as a rule, neither the companies nor the societies provide that the insurance is to be void in event of change. But it is of yet greater importance even to them to know precisely what are the death rates to be expected in each occupation, as nearly as possible.

In all of the foregoing I have said nothing concerning mortality according to location. There is, unfortunately, no doubt that there are material differences between the rates of mortality in different portions of our common country; and this will to some extent, likewise, appear as the result of the investigations to which I have referred, but the showing will be defective, for the reason that the registration districts are confined to the northeastern states, to certain of the middle west states, and a very few of the far western states. Deductions concerning this matter which are made from imperfect data are, like other inferences of which mention has already been made, unreliable; and this is particularly true, when comparisons are made merely of the so-called death-rate. These comparisons would frequently be misleading, as has already been stated, even though the deaths had been registered and correctly reported, in view of the different distributions by ages. They are also rendered peculiarly unreliable when there is no such registration, or when the registration itself is so defective that it cannot be relied upon.

It is not necessary, I am sure, to make an appeal to the members of the American Public Health Association, to use their deservedly great influence in the various communities from which they come, to forward the cause of adequate registration. There is nothing which they could do that would better supplement their efforts to improve health conditions. They could thus point clearly to the evil consequences of neglect, and, when an improvement was made, they could promptly point to the benefits accruing. It should be possible, in view of the registration statistics of the last ten years and starting from the enumeration of 1900, after the enumeration of 1910 has been made, to estimate within a reasonable range of probability the exposures during the next decade, subject, of course, to necessary amendment after the enumeration of 1920 has in turn been made. In consequence, it should be possible to supply the leading registration districts such information as will enable those who are interested in the public health, to know from year to year what improvement is being made or, if the contrary should be true, to point out the lamentable consequences of negligence. Certainly no better use could be made of any portion of the valuable facts and deductions which will be supplied by the coming census and by the work of the Permanent Bureau of the Census, than this development of the Department of Vital Statistics

AMERICAN BIRTH REGISTRATION.*

By FRANKLIN C. GRAM, M. D.,
Registrar of Vital Statistics, Buffalo, N. Y.

Inasmuch as practically every community maintains some sort of birth registration, I shall take the necessity for it as granted. But however axiomatic the question under consideration may be, a certain amount of demonstration is required to arrive at proper conclusions. I shall not attempt to discuss the many sides this subject presents. Every Vital Statistician is familiar with them. My only object is to enunciate several questions which may form the basis for a free expression of opinion by men who are constantly in touch with the practical end.

I am frank to say that, after having completed sixteen years in the service as Registrar of Vital Statistics, I find the birth statistics end the most unsatisfactory part of my work. Whatever success I have achieved has been through a slow system of education, and I know also just how to account for the failures. Personal solicitation with those responsible for filing birth returns has accomplished much, when other methods failed, but no Registrar ought to be obliged to beg for that which the law requires to be performed and in which he has only an official interest.

The Registrar who prides himself in registering one hundred per cent of all births in his community must be endowed with that same elastic conscience which Speaker Reed possessed whenever he looked Heavenward and counted a quorum. Why this uncertainty with such important statistics? The State has an interest in the new born, but that interest is mostly statistical; the real interest comes with subsequent years. As a result, the birth of a child may escape the minds of those designated by law to record it, and this omission may not be discovered until such time later when this very evidence is required by the individual or the State.

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* Read before the Section on Vital Statistics, American Public Health Association at Richmond, Va., October, 1909.

For the sake of argument, let us assume three hypotheses:

First. The importance of birth records, and what they should contain.

Second. Are American birth statistics complete?

Third. What methods should be adopted to bring them to a proper standard?

In answer to the first question, I want to cite the fact that a certain foreign element, which utterly disregards our laws and customs, persists in registering the birth of each child and immediately obtaining a certified copy of such record, so that when they and their children return, with the spoils of this country, to the land which they never foreswore, they may have documentary evidence that they were legally born—the mere fact that they exist not being considered sufficient. This custom is instilled, not by a process of education, but by stern necessity, and frequent application of the strong arm of the law.

In our own country this necessity is slowly becoming apparent everywhere, and it may safely be assumed that BIRTH STATISTICS WILL BECOME ACCURATE AND COMPLETE IN PROPORTION AS LEGAL NECESSITY FOR THEIR EXISTENCE MAKES THEM SO.

Several States have enacted Child Labor Laws, requiring children to attain a certain age and have other qualifications before being entitled to an employment certificate. The affidavit of a parent was originally considered sufficient evidence of a child's age, until it became a motive for perjury, it having been proven that eleven-year-old children would acquire fourteen years through the simple process of an affidavit. To remove the temptation for perjury, the laws of New York now require documentary evidence of the child's birth. This one act alone has done more to improve birth registration than anything thus far attempted. Parents, whose children are refused labor certificates because they cannot legally prove the date of birth, effectively advertise the fact among friends and relatives. As a result, all those interested look after their own registrations.

This is not the only principle involved. The entrance of a human being into the world is of as much importance as its exit. Why attach so much importance to the finish, and neglect the beginning? For various reasons, a community is as much entitled to a correct genealogy as the individual. The State is the

only avenue for an authoritative record which may be admitted as presumptive evidence.

And here I desire to digress sufficiently to touch upon a matter which has frequently caused me sad experiences. Let me state a case in point: A young man, intelligent, apparently of good stock, applies at the Registrar's office for a record of his birth. He states that in his infancy he was adopted by persons who do not know anything about his parents; he does not know whether he was an orphan and thus obtained foster parents, or whether his birth was illegitimate, and so became a ward of the State. His desire to know who he really is has grown with maturing years and he is probing every known avenue. In the case of a young woman about to be married, or already married, the incident is still more pathetic.

Of course, in the case of a waif found upon a door step, it would be impossible to trace its parentage. But door-step waifs are the exception. The rule is that the child was born in some maternity institution whose superintendent labors under a false impression that it is better for the future of the child to lose its identity, and, therefore keeps only such records as the law compels, and these records are usually falsified at least to the extent of assumed names. All maternity hospitals, whether public or private, should be under strict control of both State and local authorities; only legal adoptions should be permitted, the court keeping accurate records, accessible only to those directly interested; no baby farms should be tolerated anywhere—BABY FARMS ARE SIMPLY A STARVATION ROAD TO HEAVEN, the speed of travel depending upon the amount of money for which the parent can be bled; private adoptions should be prohibited, the mother not being as competent as the State to inquire into the moral and social conditions of the person to whom she entrusts her infant.

That these questions are important to every community can be certified by any registrar. What their bearing is relative to crime can be verified by criminal records. Only recently, the press reported that a certain vulture, in the guise of a woman, hovered around lying-in hospitals and offered to "adopt" the new born innocents for a money consideration. Within one month, she "adopted" a thousand dollars worth of infants who were as promptly murdered.

Do you agree with me that private adoptions should be prohibited? Do you also agree with me on the importance of birth records? Then let us consider what they should contain to render them valuable.

It requires no argument to convince anyone who has studied the subject, that the principal facts for records should be;

The GIVEN, as well as the SURNAME of the child; in case of twins, triplets, etc., THE ORDER OF BIRTH, as well as the name and sex of each, should be indicated, and ON SEPARATE CERTIFICATES; color; the exact date and place of birth; the name, nativity, age and occupation of the father; married name, maiden name, nativity and age of the mother; if illegitimate, that fact should be stated; number of mother's previous children; total number living at time of last birth record; date of record.

This, in brief, comprises all essential points, although some add the religious belief of the parents, which, from experience, I would personally approve. Still-births should NOT be included in the birth record.

Let us next consider the completeness of American Birth Registration. That our birth statistics are incomplete, even in our registration communities, must be granted. The ratio of incompleteness is variously estimated by different localities, but with our present methods I fail to see how anyone can make an accurate computation. The cause is likewise apparent. Even where the law compels registration, those having the enforcement thereof may not become aware of a birth until too late for prosecution. This neglect may not always be a wilful one. It may be due to oversight, forgetfulness, carelessness or indifference on the part of those required by law to make the original record.

Now as to the remedy. Undoubtedly every Registrar of Vital Statistics has, in the course of his experience, figured it out to his own satisfaction. Numerous remedies have been suggested, published, debated and legislated. They vary according to locality and conditions. Some suggest paying a fee to the physician or midwife for every birth certificate filed with the Registrar. This proposition has some merit and overcomes the objections of the overscrupulous who insist that the State cannot compel any service without compensation, despite the fact that

the highest courts of the land have ruled to the contrary. And where the system has been tried it has shown that even a nominal fee of twenty-five cents is a wonderful producer of birth records. But then, not all physicians are impecunious: some are affluent and would shun the implication. They show that they do not need the money by promptly forgetting all about it. These "better than the rest" physicians usually make the worst records. They are sure to omit most of the data called for on the blank, and are determined not to answer the remainder as they should be.

Others would place the Registrar under the fee system, thus making the amount of his compensation depend upon the fees for each registration. If the fee be paid by the municipality, then this plan also has merit—otherwise it is dead. "A long suffering public" is unwilling to pay for an imaginary imposition.

Then there is the plan of sending "reminders" to physicians at certain intervals, asking them to send in, for record, a certificate of every birth occurring in their practice during the intervening period.

These, and many other plans have certain merits, depending principally upon local conditions. In my opinion, however, we will eventually be obliged to follow European systems in this, as well as in many others which we have already adopted. Make it obligatory upon the parent to attend to the proper registration of every birth within a given time, and let this registration include the given name as well as the surname, and all data above enumerated, or which local conditions may require. Make it obligatory upon the parent to furnish a certified copy of this registration to school authorities, before a child can be admitted to school, and let this certificate accompany the transfer card as the child progresses in its scholastic course. In this event, every neglected registration would be discovered by the time a child is five or six years old, and proper remedies could be applied instead of allowing it to remain unregistered forever.

And lastly, whatever plan is adopted, give it moral and legal backing. Let it be a "live issue." The courts look after the dead, why neglect the living?

THE BUDAPEST SYSTEM OF DEATH CLASSIFICATION.*

By FREDERICK L. HOFFMAN,
Statistician, The Prudential Ins. Co., Newark, N. J.

The Municipal Bureau of Statistics of the City of Budapest is by far one of the best of its kind and its publications command the respect and admiration of the scientific world. The methods of statistical tabulation and analysis of the Bureau were developed and perfected by the late Dr. Körösy and his able associates Dr. Thirring, the present director, and Dr. Julius J. Pikler, the vice-director of the Bureau. The publications are issued in the Hungarian and German languages. Annually a return is issued on the mortality of Budapest, and occasionally publications on special subjects, a recent number of which deals with the details of the Budapest system of death classification, a method of tabulation and analysis in important particulars superior to any other method yet devised to meet the peculiar difficulties arising out of the complex and variable nomenclature of diseases. The two essential departures from general practice in the Budapest system are: first, the manner in which the long established death classification has been adhered to, but made to correspond to the essentials of the Bertillon system; and second, the successful tabulation and classification of double causes of death, and of complicated causes, to which in general statistical practice no publicity is given in the published returns. I shall only deal with the second of these two improvements in statistical methods, and very briefly, as follows:

Every registration official is familiar with the difficulty of securing a correct classification of death certificates which contain more than a single cause of death. An elaborate system has been devised to overcome this difficulty, but every result is more or less impaired by unavoidable errors of judgment or the ignorance and often the mere caprice of the registrar. Nevertheless, much good has resulted from uniformity of action, but the Budapest system avoids the present difficulties by giving pub-

* Read before the Section on Vital Statistics, American Public Health Association at Richmond, Va., October, 1909.

licity to all the facts which are recorded on the death certificate. As observed by Dr. Cressy L. Wilbur in his observations on "Co-operative Methods for Improving the Usefulness of Statistical Classifications of Causes of Death," "For the treatment of jointly returned causes of death no systematic method applicable to all classes of returns has as yet been introduced. It is usual in statistical offices to keep a book of practice showing decisions in such cases, and in time precedents may be collected showing the assignments of the most common causes when returned together." A tabular arrangement has also been prepared by Dr. Bertillon, which, however, as pointed out by Dr. Wilbur, "deals only with the definite titles, not with the numerous terms of varying degrees of accuracy included under the titles, and the judgment of the statistician would often be required as to whether the relative assignments of certain titles should govern the assignments of certain terms included." This difficulty is overcome by the Budapest system, which, in the case of joint or double causes of death, assign first the determining or most important cause, which afterwards governs in the general classification, but which at the same time gives the required publicity to second or additional causes contributing directly to the death or which complicated the course of the disease. Under the present methods, for illustration, the death of a chronic drunkard due directly to consumption, but seriously complicated by chronic alcoholism, is recorded under consumption and the fact of the complicating cause is absolutely lost in the registered mortality. A death from typhoid fever complicated by valvular disease of the heart must, by the present method, be classified under one or the other of these terms, but the statement made by Dr. Wilbur that "The death can not be compiled under both typhoid fever and organic heart disease" is only correct as regards the present system of classification. The Budapest system easily overcomes this serious difficulty in a very simple but very effective manner, and the practical value of the system is illustrated by the fact that it has been in use for sixteen years.

In the Budapest mortality for 1907, out of 16,184 deaths from all causes, 1,756, or 10.8%, were deaths with complications, or in other words, deaths of which the official certificate or record

contained mention of more than one disease, complication or important collateral condition bearing upon the immediate cause of death. The percentages of joint or complicated cases vary materially, however, for the different causes, so much so that for certain causes the returns by the single classification are practically valueless—in fact, they are not only valueless but they are sometimes grossly misleading. This is best illustrated in the case of alcoholism, which, according to the single classification in Budapest, would be responsible for only 19 deaths, but according to the supplementary classification there were 87 deaths in which alcoholism was of more or less significance as a cause contributing directly to the death. In the case of rachitis, the single classification would have shown only 53 deaths, while there were 99 additional deaths in which rachitis was a complicating factor, resulting, therefore, in a total of 152 deaths. In so important a cause as peritonitis, by the single classification only 106 deaths would be returned, while the amplified classification would return 190 deaths in which peritonitis was either a direct or a contributory cause of mortality. In other words, in the case of alcoholism, 78.2% of the mortality with alcoholism as a complication would be unrecorded; in the case of rachitis, 65.1%; and in the case of peritonitis, 44.2%. For certain other diseases the percentages are less, but of very considerable significance and importance. In the case of bronchitis, by way of further illustration, 26.1% of the mortality would be unrecorded by this system of single classification; in pneumonia, 26.5%; in nephritis, 22.4%; and in degeneration of the heart, 23.6%.

These illustrations will suffice to emphasize the importance of the subject as one which should receive most careful and early consideration, so that as far as practicable the annual reports on the health of the nation and the states and municipalities may be correspondingly corrected to throw more light on the true factors of mortality. The fact, in other words, at the present time is that by a system of single death classification only one cause of death is recorded, while all the other contributory factors which may, and very often, have serious significance, remain unrecorded. Under the Budapest system the proportion of such unrecorded collateral factors may range from 10% to 80% of the particular diseases affected. It is evident that as long as this is

the case both general and preventive medicine must fall short of their highest degree of scientific perfection and public utility. Since the Budapest system has been in use for sixteen years the experience gained is not only very large but may be considered thoroughly representative for other countries. Under the Budapest system every important fact on the death certificate is considered in the final tabulation according to sex but without other elaboration in matters of detail.

Naturally, in all cases the determining cause of death, or the most important cause of death, is first indicated in the usual manner, and the cause is assigned its proper number under the general system of classification in the principal tables, and of such causes there are 83 in the Budapest system. When this is done every one of these causes is carefully gone over, and in the form of a special tabulation, the secondary or additional, or complicating causes are enumerated in the order of their sequence. This is of particular importance in the grouping of other or miscellaneous causes not specifically classified, such, for illustration, as "other infectious diseases" and "other constitutional diseases"; the latter, under the Budapest system, would be No. 31 of the general classification, but under the amplified classification it was found that 16 diseases had thus been classified, including 53 deaths from rachitis and 45 from chronic alcoholism; also one from mercurialism and two from trichinosis. One might easily be led to the conclusion, therefore, on examining merely the general returns, that no deaths from trichinosis or mercurialism had occurred in Budapest during the year under consideration. All these causes would be classified under the secondary or additional classification, as set forth in brief tabular form in the annual reports. Having thus been made a matter of record it is, of course, at any time comparatively easy to study the mortality in further detail from the original certificates if it is desired that this should be done. The classification serves also the very important purpose of correcting mistakes which are certain to occur under any system of death classification, however theoretically perfect, due to errors of judgment or lapse of memory on the part of the registrar. In the Budapest experience, including from 15,000 to 16,000 deaths per annum, it has been found that this supplementary classification requires about

eighty hours of work, or about two weeks, during the year. It is held that this additional working time is not really an additional expense but rather a corrective method and a check upon the accuracy of the original decisions and subsequent classification under single causes. It does away entirely with mere memory, or with serious errors of judgment, in the treatment of jointly returned causes of death. But whatever errors may be made in the decisions as to ultimate classification, they are, under the Budapest system, made a matter of public record, so that they can be subsequently verified, or changed, or allowed for, as the case may be. Under the system in general use such errors are completely hidden, and the tables have an appearance of scientific accuracy not actually inherent in the returns.

In the Budapest experience it has been found that supplementary classification is necessary in only about thirty causes of death, so that the technical difficulties of supplementary classification are not as serious as they might at first appear to be. It is held by the Budapest authorities that in part the necessary labor is but an amplification of the system of single classification in that it enlarges the grouping under other causes of death, which comprehends, according to the Budapest experience, about 15% of the total mortality. But however this grouping may be enlarged, it can not do away with the practical necessity of stating in amplification the additional causes of death more or less contributing to the mortality from the recorded causes under the system of single classification.

It is rather difficult to give a brief account of the office practice under the Budapest system since the full tabulation takes up some twenty pages of the text of the special report. There are three standard tables in use, the first stating the number of deaths, by sex, according to primary and secondary causes; the second, showing the tabulated complications of the primary causes; and the third, showing the assignment or final classification of secondary causes under the eighty-three leading causes and their respective subdivisions. This is the best possible translation which I am able to make of the German terms as used in the report, but the meaning is made more clear by the following explanations and specimen tables.

Selecting for the present purpose the mortality from peritonitis, which, according to the Budapest system is No. 66 of the standard classification, and according to the Bertillon system No. 34, there were classified under this table 134 deaths under this disease as a principal cause of death, and 72 additional cases in which peritonitis was a complication. The deaths from peritonitis itself are grouped under four sub-titles, that is, first, deaths from peritonitis not amplified; second, acute; third, chronic; and fourth, pelvic peritonitis specifically so returned in the death certificate. All of the facts are set forth in tabular form as follows:

TABLE I.

MORTALITY FROM PERITONITIS (1907).

(No. in Budapest System, 66)
(No. in Bertillon System, 34)

	Peritonitis as the Principal Cause		Peritonitis as a Secondary Cause		Total	
	M.	F.	M.	F.	M.	F.
Peritonitis, (n. s.)	41	69	40	32	81	101
" acute	2	4	..	..	2	4
" chronic	1	..	..	..	1	..
" pelvic	..	1	..	..	..	1
Total	44	74	40	32	84	106

This table shows precisely how far peritonitis was really a factor in the mortality of Budapest during the year 1907, a factor not measured accurately by the single classification of deaths but only brought out in its true significance by the supplementary classification of secondary and complicating causes.

While according to the preceding table there were 118 deaths from peritonitis classified as such, with peritonitis as the principal cause of death, the question arises how far in these cases there were complicating factors not disclosed by the first statistical enumeration. These facts are brought out, therefore, in the following supplementary table:

TABLE II.

(No. in Budapest System, 66)
(No. in Bertillon System, 34)

DEATHS CLASSIFIED AS PERITONITIS AND COMPLICATING CAUSES

	Males	Females
Peritonitis (n. s.)	38	68
" and pyaemia	1	1
" and arteriosclerosis	1	..
" and enteritis	1	..
" acute	2	4
" chronic	1	..
" pelvic	..	1
Total	44	74

According to this table, out of the 44 deaths of males from peritonitis, 38 were deaths not complicated by other causes, while six deaths were complicated by five other specified diseases or amplified by explanatory titles. The 74 deaths of females from peritonitis included 68 deaths from this disease not complicated by other diseases, 1 complicated by pyaemia, 4 specified as acute, and 1 as pelvic peritonitis. It is evident that the complicating causes were of less serious importance than the primary cause, and for this reason the deaths were properly classified as peritonitis in the first column of the first table.

In the second column of the first table there appear 72 deaths in which peritonitis was a complicating factor, but of lesser importance than the causes under which the deaths involving such complications were subsequently classified. The 72 deaths in which peritonitis was a complication were classified under 32 different causes, as set forth in detail in the following table:

TABLE III.

(No. in Budapest System, 66)
(No. in Bertillon System, 34)

DEATHS CLASSIFIED AS STATED WITH PERITONITIS AS A COMPLICATION.

Cause of Death Under Which Classified	Males	Females	Total
Scarlatina, nephritis	..	1	1
Influenza, pneumonia	..	1	1
Puerperal fever	..	1	1
Erysipelas	..	1	1
Lues acquisita, myelitis, (syphilis)	1	..	1
Tuberculosis, pulmonary	2	1	3
" intestinal	2	1	3
Cancer of stomach	1	1	2
" liver	..	1	1
" intestines	1	..	1
" kidney	..	1	1
Valv. disease of heart	..	1	1
Thrombosis	1	..	1
Ulcer of stomach	1	1	2
Hernia incarcerata	1	1	2
Appendicitis	9	7	16
Appendicitis, degeneratio myocardii	..	1	1
Ulcer of intestines	1	1	2
Fistula vesicorectalis	1	..	1
Polyposis recti	..	1	1
Cholelithiasis	1	..	1
Cholecystitis	..	2	2
Endometritis	..	2	2
Inflammation of uterus	..	2	2
Prolapsus uteri	..	1	1
Perimetritis purulenta	..	2	2
Oophoritis purulenta	..	1	1
Hypertrophia prostatae	1	..	1
Abscessus colli	1	..	1
Casus fortuitus	11	..	11
Homicide	4	..	4
Homicidium alcoholismus	1	..	1
Total	40	32	72

According to this table 16 of the deaths, for illustration, were from appendicitis, and on account of the greater importance of this disease as a determining cause of death, the cases are properly classified as appendicitis and not as peritonitis. It is

nevertheless, of importance to note that such complications occurred and the numerical extent of their occurrence is clearly brought out by this method of statistical analysis and by this method alone. Of course, many other illustrations could have been given to emphasize the practical value and importance of this method, but additional details would unduly enlarge the present discussion.

The office method of dealing with such double or complicated causes is to write additional cards or slips containing the essential particulars, which of course materially facilitates the handling of the data. The time required for this supplementary analysis has been made a matter of record and the additional expense incurred is not a matter of material importance. The author of the report is of the opinion that without this method of supplementary analysis the official mortality returns are materially impaired in their value and utility for scientific and general purposes. This conclusion is fully sustained by the experience of sixteen years and it has the sanction of perhaps the most qualified judgment on the subject. The adoption of this system by the Division of Vital Statistics of the U. S. Census, and the registrars of American states and cities, would very materially improve the scientific and general value of their reports.

TRADE MORTALITY STATISTICS.*

By FREDERICK L. HOFFMAN,
Statistician, The Prudential Ins. Co., Newark, N. J.

The substantial increase within recent years in the economic value of the working lifetime of persons employed in productive industries makes its conservation a matter of national and local concern, and the prevention of industrial diseases and accidents a governmental and individual duty. A large number of problems arise out of this conclusion, and their present-day importance is made evident by the increasing public consideration given to matters of employers' liability, workmen's compensation, labor protection, legislation, and insurance. As yet the basis of fact and information for such legislation and far-reaching projects for a state policy of labor protection is very indefinite and most of the conclusions as to a radical course in the present industrial system are not sustained by trustworthy statistical data subjected to a qualified statistical analysis. Curious as it may seem, it is the lamentable truth that not a single American state or municipality includes in its annual reports on the public health a thoroughly digested tabulation of the mortality by occupations, and while in some states, particularly Rhode Island, trade mortality statistics have been compiled for many years, the form in which the data are presented partly precludes their extended use for practical purposes and impairs their utility in connection with pending questions of social betterment.

It is hardly necessary for me to point out and discuss in detail the common faults of the statistical tabulation of occupation mortality data. It is sufficient to state that, almost without exception, the returns as given in most of the published reports have no practical value whatever except in a few of the registration states, for which they can be utilized if used with great caution. The essential and absolutely indispensable requirement is that the tabulation shall be by principal occupations according to age and cause of death, in conformity to the method adopted by the Board of Health of Sheffield, England, and the

* Read before the Section on Vital Statistics, American Public Health Association at Richmond, Va., October, 1909.

New Jersey State Board of Health. except that in the reports of this Board, by a curious omission the age at death of "all other causes" by occupation is not given, so that it is impossible to make practical use of the data at the present time. The Sheffield method has been fully explained by Mr. F. S. Crum in a paper published in the Quarterly Publications of the American Statistical Association for December, 1908.

The method simply requires that for each important occupation the deaths shall be classified in the usual manner, but by preference in the age grouping adopted for many years by the Registrar-General of England, that is, 15–19, 20–24, 25–34, 35–44, etc., but the classification by decades shall be continued to the end of life and not terminate, as is the case in the English statistics, with age 65 and over, for it is manifest that the effect of unhealthful trades can not be traced with accuracy into the later years of life unless the age distribution of deaths is given in sufficient detail. The classification by causes may be limited to a few essentials, particularly consumption and other tuberculous diseases separately, pneumonia and other respiratory diseases separately, liver diseases, lead and industrial poisoning, and accidents. For important industrial centers, where particular industries predominate, such as, for illustration, in the case of the pottery industry at East Liverpool and Trenton, or the textile industry at Fall River and New Bedford, the occupations should as far as possible be given in detail according to the chief branches of the industry rather than for the industry as a whole. To facilitate the tabulation and to economize in space most of the occupations classified under professional and personal service, clerical and mercantile, or employments generally understood to be free from health-injurious influences or particular occupation dangers, may be omitted. As an admirable illustration of how, under strict limitations, occupation vital statistics can be utilized to great practical advantage, mention may be made of the annual reports of the Board of Health of the city of Blackburn, England, in which for many years the mortality of textile operatives has been presented in a form which may serve as a model for simliar investigations in this country.

The standard death certificate as well as the general certificate in use throughout the country, almost invariably contains

the question as to the occupation of the decedent at the time of death. Evidently, however, the word occupation requires more exact definition since in many cases the industry engaged in is too broad a term to define the exact employment in which the decedent was engaged. I have frequently suggested to the proper authorities that the death certificate be modified so as to disclose accurately, first, the industry in which the deceased was engaged; and second, the actual occupation followed. The practical difficulty confronting the adoption of this suggestion lies in framing a very brief expression of both terms, which by long usage have become almost the equivalent of each other. But to return the occupation of a person only according to the industry in which he was engaged tends very often to disguise the most important factors in particular callings injurious to life and health.

To return, for illustration, the occupation of a person as a textile operative leads to no practical result when the object is to trace with accuracy the health-injurious effects of continuous employment in the different branches of cotton manufacture; for example, in the carding room or the weaving sheds. A correct classification would require that the certificate should state, first (in the case cited) that the decedent was employed in "cotton manufacture," and second, that his particular occupation was that of a carder, or a spinner, weaver, loom-fixer, general mechanic, etc. Only when this distinction is made can the data be utilized for really practical purposes in connection with pending investigations into the duration of normal trade life and the conditions and circumstances which more or less shorten it. With every advance in industrial medicine or the practical specialized consideration given to diseases particularly common in certain occupations or exclusively affecting certain industries, the necessity for a more precise classification and a more careful and extensive tabulation of occupation mortality becomes clearly apparent, and a board of health falls short of its greatest public usefulness by not including occupation mortality statistics properly classified and analyzed more or less according to the method referred to, in its annual reports on the public health.

Beginning with 1890 the decennial reports on mortality of the Federal census have contained an analysis of occupation mortality statistics for certain selected industries and occupations. The statistics are of some value but they require to be used with great caution. They can not as yet be compared in usefulness with the corresponding analysis of the occupation mortality of England and Wales, which has lately been enlarged to include the mortality of the retired according to the occupation which had been followed through the working lifetime. Since the English reports have become the standard authority on occupation mortality throughout the world it would seem best for American registrars to model their own reports and tabulations of occupation mortality data on the same line.

It is not necessary, however, in my opinion, and it will often prove inexpedient, to give full details for all occupations or for all causes of death. In the case of industrial centers particular employments may be selected and specialized according to the various and more important occupations followed. Too much discretion, however, is not advisable since quite often the most injurious employments are represented by but a small number of deaths each year, the value of which is cumulative and the returns of which warrant final conclusions only after a period of years. From the published occupation mortality statistics persons employed in professional and even personal service may, if necessary, be excluded, but city firemen and policemen should be included on account of the danger and exposure incident to their callings. In transportation and communication all of the employments should be included, but in mercantile undertakings many occupations may be excluded when lack of space precludes an adequate presentation of the facts. The principal consideration should be given to persons employed in manufacturing and industries generally, and perhaps it is best to include all occupations classified under these terms. The same conclusions hold true of building and construction, and finally of agriculture, fisheries, navigation, mining, quarrying, etc. For practical purposes it will be best to classify only the decedents aged 15 and over, and after summarizing the occupations specifically returned according to age and cause of death, the remainder should be grouped as "other occupied males," or as "other males," or if

the sex distinction is not made, as "other persons aged 15 and over," so that comparison may conveniently be made of the mortality in particular callings in particular communities, with the aggregate mortality of men and women, or persons employed in all occupations, or unemployed and retired, as the case may be.

The causes of death which require particular consideration are chiefly those which I have already mentioned. To these may be added, if space is available, typhoid fever, cancer, rheumatism, alcoholism, nervous diseases, circulatory diseases, digestive diseases, and urinary diseases considered as groups in the usual form. For all practical purposes, however, it will probably be sufficient to limit the number of occupations to be presented in detail in the report as well as the principal causes of death, but whatever selection is made one fact must not be overlooked and that is that the diseases not specifically classified must also finally be stated in a group according to the age at death and occupation, so that for each occupation a complete statement is available for the deaths from all causes according to age. When the classification is limited to say consumption and other tuberculous diseases separately, to pneumonia and other respiratory diseases separately, to liver diseases, lead and other industrial poisoning, and finally accidents, for present purposes at least, the most urgent need for definite and conclusive occupation mortality data will be met.

The question now arises as to the method by which occupation mortality is to be measured. The best method, of course, is to calculate the mortality on the basis of the population engaged in different trades. As a practical matter it will often be found next to impossible to do this. Unless a special occupation census is taken and repeated at regular intervals every few years, it will be a hopeless task to determine the number of persons engaged in particular callings as considered separate and distinct from the industry as a whole, not only with the required accuracy as to their number but with respect to their age and sex distributions. Of course, the decennial census or the state censuses at quinquennial periods are of great value and they permit of utilizing certain data for certain occupations and industries, but they very rarely apply to particular and localized problems. Another factor which impairs their value during intercensal

years is the rapid growth, particularly of industrial centers, or possibly, pro contra, their decay, due to sudden changes in industrial conditions, so that at best and at most the accurate calculation of mortality rates per thousand of persons employed, according to divisional periods of life and particular causes, is not only a very difficult task, but for many American industrial centers a practically hopeless undertaking.

To overcome this inherent difficulty I would suggest the use of a method which I have employed in numerous statistical investigations of this kind and as a rule to decided advantage. This method I have called "the proportionate mortality," since it clearly exhibits the true quantitative incidence of any particular cause of death at any selected divisional period of life. The method, in brief, consists in first separating the total number of deaths in any particular occupation according to divisional periods of life, and then the arrangement of the mortality in each group according to the principal causes of death. By adopting the mortality in all occupations, or in any selected group of exceptionally healthful occupations as a standard, a trustworthy comparison can be made of the specific incidence of any particular disease at any specified period of life. It is true, of course, that the resulting proportion on a percentage basis can not be utilized for insurance purposes in the calculation of premium rates, but the method, for sanitary purposes, furnishes with approximate accuracy a quantitative measure of mortality from particular causes, chiefly such as fall within the class of preventable diseases.

I may illustrate this method briefly as follows: Out of 1,590 printers dying during the period 1897–1906, in the experience of a representative industrial insurance company, 344 of the deaths from all causes were at ages 15–24, and of this number 167, or 48.5% were from consumption. The normally expected proportion of deaths from consumption at this period of life in the mortality of males in the registration area during the years 1900–1906 was only 27.8%, so that, as measured by this standard the mortality from consumption among printers was decidedly excessive. At ages 25–34 there were 439 deaths from all causes among printers, and of this number 247, or 56.3%, were from consumption. The corresponding percentage for males in the registration area, adopted for the present purpose as a standard,

was only 31.3%, so that as determined by this method the mortality of printers from consumption at this period of life was decidedly excessive. At ages 35–44 the percentage of deaths from consumption among printers was 40.5, and for males in the registration area 23.6; at ages 45–54 the percentages were 19.9 and 15.0; at ages 55–64 they were 9.2 and 8.1; and at ages 65 and over the percentages were 3.7 and 2.7, respectively. In other words, at every divisional period of life the proportion of deaths from consumption in the mortality from all causes was decidedly excessive among printers, as compared with the mortality of males in the registration area; but since the latter includes all occupations, a more rigid standard, limited to recognized healthful employments would have brought out a still more striking contrast. While the consumption mortality of printers was excessive at all ages, the excess was most pronounced at ages 25–34. By the use, therefore, of the proportionate mortality factor it is possible to arrive at definite and at least approximately accurate conclusions, which, on further investigation, will as a rule be sustained by the results of qualified inquiry into the actual and more or less health-injurious conditions under which many industries are carried on. This is particularly true of the mortality from consumption in dusty trades, and in nearly all such cases the evidence of the excessive proportionate mortality from consumption is confirmed by the conclusions of experts in industrial medicine.

The method of proportionate mortality analysis would, therefore, seem to be best adapted to the practical requirement of sanitary administration, and the most convenient for intelligent presentation in the annual reports on the public health. In selecting the standard of comparison it will probably be found that the normal average for the registration area as a whole will serve every practical purpose to emphasize the more or less health-injurious consequences of employment in certain trades as far as such consequences are traceable in the resulting mortality. While this method is not perfect it is nevertheless the best possible compromise between the practically unattainable and the present-day complete neglect of one of the most important problems of the time.

SMALLPOX IN THE UNITED STATES*

By JOHN W. TRASK, M. D.,

United States Public Health and Marine-Hospital Service.

GENERAL PREVALENCE.

Smallpox has appeared to be unusually prevalent in the United States during the last ten years. In several of the states the greatest number of cases was reported in the years 1902, 1903, and 1904. In 1902 Massachusetts reported 2,314 cases. In the same year New York State reported 450 deaths which in all probability represented at least 9,000 cases. During the year ending October 31, 1904, Pennsylvania had 5,172 known cases; in 1902 Michigan had 7,086; Ohio in 1903 had 6,903; Wisconsin during the year ended October 1, 1903 had 2,897 known cases. In 1904 Florida reported 973 cases and Indiana 6,185. During the year ended May 1, 1905, North Carolina had 7,375 and in 1907 Colorado with a total population of a little over half a million, had 1,119 known cases.

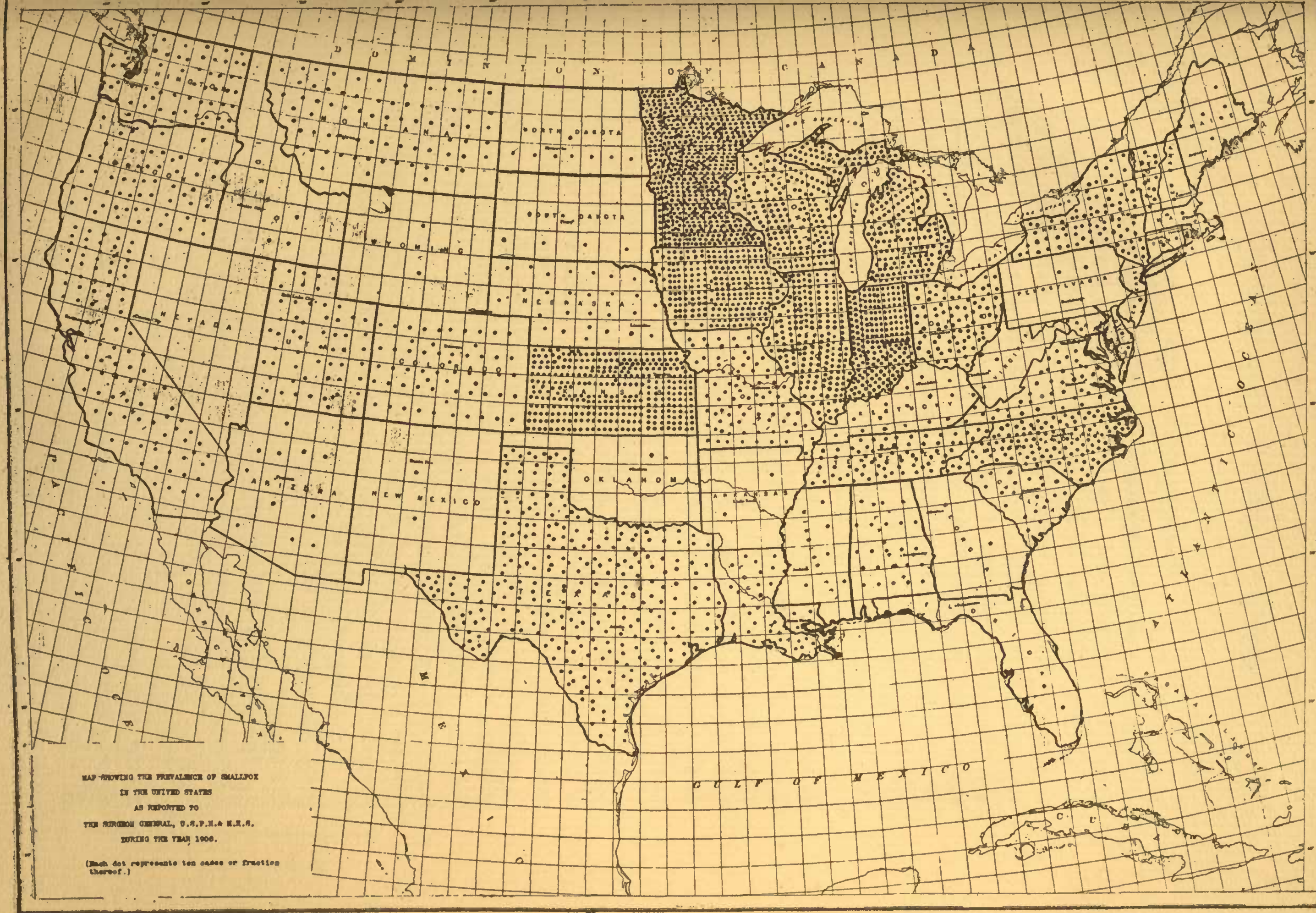
SMALLPOX IN 1908.

The number of cases of smallpox reported to the Surgeon-General of the Public Health and Marine-Hospital Service during the calendar year 1908, by the local and state health officers and registrars of the various states was as follows:

* Read before the Section on Vital Statistics, American Public Health Association at Richmond, Va., October, 1909.

State	Number of Cases	Number of Cases per 1,000,000 of Population*
Alabama	230	112
Arkansas	14	10
California	986	588
Colorado	571	909
Connecticut	4	4
Delaware	1	5
Florida	18	28
Georgia	3	1
Idaho	21	102
Illinois	2,067	374
Indiana	2,064	753
Iowa	2,488	1,131
Kansas	3,458	2,096
Kentucky	159	67
Louisiana	287	184
Maine	37	51
Maryland	11	8
Massachusetts	15	5
Michigan	2,091	804
Minnesota	7,031	3,397
Mississippi	44	25
Missouri	863	254
Montana	732	2,339
Nebraska	271	253
Nevada	0	0
New Hampshire	0	0
New Jersey	3	1
New York	846	101
North Carolina	1,256	604
North Dakota	78	159
Ohio	863	192
Oklahoma	7	5
Oregon	664	1,369
Pennsylvania	12	2
Rhode Island	1	2
South Carolina	175	119
South Dakota	26	55
Tennessee	676	307
Texas	3,161	873
Utah	575	1,780
Vermont	107	305
Virginia	396	199
Washington	596	946
West Virginia	8	7
Wisconsin	1,925	840
Wyoming	15	143
Dist. of Columbia	193	618
Arizona	110	764
New Mexico	15	69
Total	35,174	

* For this purpose the estimated population as published by the Bureau of the Census was used.



MAP SHOWING THE PREVALENCE OF SMALLPOX
IN THE UNITED STATES
AS REPORTED TO
THE SURGEON GENERAL, U.S.P.H.& M.H.S.
DURING THE YEAR 1906.

(Each dot represents ten cases or fraction thereof.)

DESCRIPTION OF MAPS.

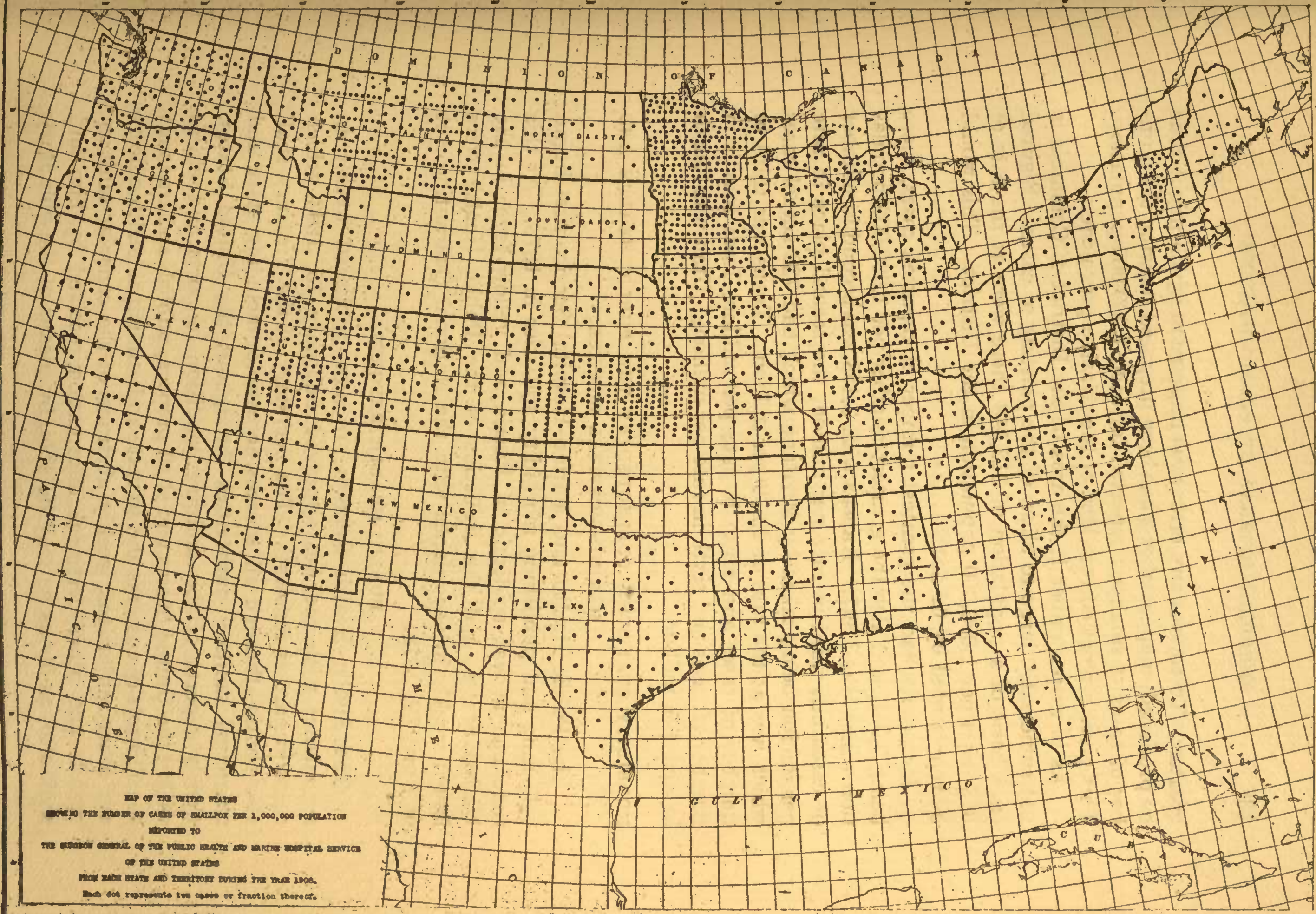
Map No. 1 shows the actual number of cases reported from each state and territory. Each dot represents ten cases or fraction of ten. It is not desired to convey the impression that the map shows the actual number of cases which occurred in all the states nor in each state, nor that it gives an accurate picture of the relative distribution of the disease. The map merely shows the number of cases of which the Public Health and Marine Hospital Service has been able to secure reports. It may therefore be considered as giving the number of cases of which there is official knowledge and which thus constitutes the known minimum. How many more cases there were which were not reported, or how small a percentage of the whole those here enumerated constitute, can only be conjectured. Some of the states which appear as having had but few cases undoubtedly had but little smallpox. Others appear to be comparatively free from the disease very probably because their cases were not reported or if reported were inaccessible for this compilation.

It is entirely possible that some of the states which appear to have had the greatest number of cases had no more and possibly even a less number than others which appear as having had much fewer cases of the disease. This might very readily be brought about by the fact that the disease was reported in some states and not in others. The states showing many cases can at least have the satisfaction of knowing that their smallpox cases have been reported and systematically recorded, and that thus having a knowledge of existing morbidity, they possess the essential factors for effective sanitary remedial measures.

In making the map no attempt has been made to group the cases according to the localities in which they occurred within the state.

The District of Columbia had 193 reported cases but owing to the small map area covered by the District, it was impossible to place the 20 dots which would represent them.

Due to the varying densities of population in the different states, the same relative incidence of the disease causes more dots to be placed in some states than in others where the relation of the cases to the population may be the same or even



MAP OF THE UNITED STATES
SHOWING THE NUMBER OF CASES OF SMALLPOX PER 1,000,000 POPULATION
REPORTED TO
THE SURGEON GENERAL OF THE PUBLIC HEALTH AND MARINE HOSPITAL SERVICE
OF THE UNITED STATES
FROM EACH STATE AND TERRITORY DURING THE YEAR 1906.
Each dot represents ten cases or fraction thereof.

greater. To correct any erroneous impression which might thus be produced, map number 2 has been prepared showing the number of cases of smallpox reported for each 1,000,000 population. This gives a more correct idea of the relative prevalence.

As in map number 1, the area of the District of Columbia is not sufficiently large to allow of the plotting of cases. Figured on a basis of a population of 312,548 there were at the rate of 618 cases per 1,000,000 population in the District. This would be represented by 62 dots.

Minnesota had the greatest number of reported cases, there being 7,031, and also the greatest number per 1,000,000 population which was 3,397. Kansas with 3,458 was second in number of cases but third in rate per million, the second place in rate per million being taken by Montana which had 732 actual cases which was at the rate of 2,339 per million. Texas was third in number of cases and ninth in rate per million, Iowa fourth in number of cases and sixth in rate per million. Utah was fourth in rate per million.

MORBIDITY STATISTICS COLLECTED BY THE PUBLIC HEALTH AND MARINE–HOSPITAL SERVICE.

The Public Health and Marine–Hospital Service first began collecting and publishing morbidity statistics in 1878. At this time plague was epidemic in Russia and yellow fever in the United States, and the Bulletins of the Public Health were issued weekly in accordance with the National Quarantine Act of April 29, 1878.

PUBLIC HEALTH REPORTS.

The Public Health Reports are now published weekly in accordance with the Act approved February 15, 1893, which reads in part as follows: "The Secretary of the Treasury shall also obtain, through all sources accessible, including state and municipal sanitary authorities throughout the United States, weekly reports of the sanitary condition of ports and places within the United States and shall prepare, publish and transmit to collectors of customs and to state and municipal health officers and other sanitarians, weekly abstracts of the consular sanitary reports and other pertinent information received by him and shall also, as far as he may be able, by means of the voluntary

co-operation of State and Municipal authorities, of public associations, and private persons, procure information relating to the climatic and other conditions affecting the public health."

The diseases to which greatest attention has been given in these publications are cholera, yellow fever, smallpox, leprosy and plague. It has been attempted in the Public Health Reports, and it is believed that the attempt has been highly successful, to give weekly a dependable record of the status of epidemics of the above named diseases both in the United States and abroad. The information given by this current record has been found to be essential for the efficient administration of the maritime quarantine and the reports are in daily use by the quarantine officers of foreign governments as well as our own. In times of epidemic in the United States the record of morbidity as shown by these reports, has been a first essential in determining upon the necessary suppressive measures and when and where to employ them.

COLLECTION OF STATISTICS.

The morbidity statistics collected in the United States are secured as follows: (1) Officers of the Public Health and Marine-Hospital Service report weekly by letter the number of cases and deaths from contagious diseases occurring in the cities in which they are stationed. In times of epidemic they report by telegraph as often as necessary. (2) Health officers and registrars of cities of 10,000 population and over report weekly on blanks prepared for the purpose. (3) The published bulletins of cities and state health authorities are received and used. (4) As an additional means of making the smallpox records more complete the bureau receives press clippings referring to this disease and whenever cases are noted at places from which reports are not received direct, a letter is written inclosing blanks for their report. The form which for some years has been supplied to health officers and upon which smallpox and other diseases have been reported is shown on page 140. A new blank which has just been prepared and which is now being sent out to replace the other one is shown on page 141. It will be noticed that in the new blank several diseases have been added. These are Pellagra, Leprosy, Hookworm Disease,

(*Old Form.*)
SANITARY REPORT—DOMESTIC.

Name of place.....................................
Date ...., 190

To the Honorable
THE SECRETARY OF THE TREASURY
(Bureau of Public Health and Marine-Hospital Service),
Washington, D. C.

SIR:

I have the honor to make the following Report of Contagious Diseases, and of the deaths which occurred therefrom, at this place during the week ended.............................., 190....

DISEASES	CASES	DEATHS	REMARKS
Plague....................	....	....	....
Cholera, Asiatic.............	....	....	....
Yellow Fever...............	....	....	....
Smallpox..................	....	....	....
Varioloid..................	....	....	....
Varicella..................	....	....	....
Typhus (or Ship) Fever......	....	....	....
Enteric (or Typhoid) Fever...	....	....	....
Scarlet Fever...............	....	....	....
Diphtheria.................	....	....	....
Measles...................	....	....	....
Whooping Cough............	....	....	....
Tuberculosis................	....	....	....
TOTAL................	....	....	....

Total number of deaths from all causes reported during the week ....
Population according to census of.................., 190 ....
Present officially estimated population.................... ....
Prevailing diseases, and other pertinent information.................
....
....

Respectfully,

....

....

NOTE.—Please fill all blanks properly, and brief other side before transmittal.

(*New Form.*)

SANITARY REPORT—DOMESTIC.

Postoffice address..........................

Date.............................., 190

To the Honorable

THE SECRETARY OF THE TREASURY,

(Bureau of Public Health and Marine-Hospital Service),

Washington, D. C.

SIR:

The following is a report of the number of cases of the diseases enumerated which occurred in the {city* / town* / county*} of.................... during the week ended Saturday,.........................., 19...

DISEASE	CASES	DEATHS	REMARKS
Pellagra....................	....	....	No. cases in institutions....... No. cases not in institutions.......
Leprosy....................	....	....	No. cases in institutions....... No. cases not in institutions.......
Hookworm disease...........	....	....	....
Smallpox..................	....	....	....
Varicella..................	....	....	....
Tuberculosis...............	....	....	....
Enteric (or typhoid) fever.....	....	....	....
Scarlet fever...............	....	....	....
Diphtheria..................	....	....	....
Measles.....................	....	....	....
Whooping Cough............	....	....	....
Plague......................	....	....	....
Cholera (Asiatic)............	....	....	....
Yellow Fever...............	....	....	....
Typhus (or ship) fever........	....	....	....
Rabies—In man.............	....	....	....
In animals..........	....	....	....
Tetanus....................	....	....	....

Total number of deaths from all causes reported during the week ....

Population according to census of 19...., ...

Present officially estimated population..............................

Conditions affecting the Public Health..............................

....

................................., Health Officer

for the {city* / town* / county*} of ....

State of..

NOTE.—(a) Additional copies of this blank, and addressed envelopes for their return, will be furnished upon application to the Surgeon-General, Public Health and Marine-Hospital Service, Washington, D. C.

(b) You will confer a favor by placing the Surgeon-General, Public Health and Marine-Hospital Service, Washington D. C., on the mailing list for all bulletins and reports issued by your office.

* Cross out the two words which do not apply.

Rabies and Tetanus. It is appreciated that with the exception of leprosy these diseases are not ordinarily reportable, and that therefore, complete records will not be obtained. However, at the present time we have practically no statistics of these diseases and in the case of pellagra and hookworm disease, no reliable means of estimating their prevalence. It is believed that a partial record will be of far greater value than no record at all, and that these statistics will at least show the geographical distribution of the diseases in question if not the total number of cases. It is also believed that such statistics will be of the utmost value in indicating necessary sanitary measures.

It is recognized that the method of collecting these statistics of disease is not ideal, and that the results are not perfect, but it is believed that the method is perhaps as good and the compiled statistics as complete as can be made with the prevailing systems of registration.

In the collection of statistics of smallpox by the various methods employed, occasionally the same cases will be reported to the Bureau from different sources. To avoid duplication all reports are carefully checked. It would be much more satisfactory if it was not necessary to use these various means of collecting the statistics of smallpox and other diseases, but if instead all reports could be received direct from the state health authorities, as is now done from some states. Of course this method would be satisfactory only in those states in which records of morbidity were maintained and in which the state health authorities were willing and able to forward a transcript of their records at regular intervals. This cooperation is greatly to be desired. On it depends the satisfactory collection of morbidity statistics.

The Public Health Reports have for the most part been intended to show the current prevalence of contagious disease and have been prepared for immediate use rather than for an accurate record of cases and deaths which can only be obtained after some delay and are, therefore, useful mainly for purposes of comparison and study.

GENERAL PREVALENCE OF SMALLPOX.

Smallpox is undoubtedly more prevalent in the United States than it should be. Just how many cases are occurring it is impossible to say owing to the inaccessibility or absence of records. It remains to be seen whether the conditions which have existed for a decade and still exist are accidental and constitute an unusual prevalence of the disease due to unknown natural causes which will disappear in time causing the disease to subside.

If there were 35,174 cases in the United States in 1908, or even presuming that the number was twice this or over 70,000, which is undoubtedly more nearly correct and possibly still too low a figure, and presuming that only one-tenth of the people in the United States are unprotected by vaccination, a figure also undoubtedly too low, then the unprotected 8,000,000 or 9,000,000 could annually supply 70,000 victims indefinitely, so that we can hardly assume that the disease will necessarily exhaust itself, and even if it does there would seem to be nothing to prevent its constant reappearance.

The prevention of smallpox constitutes a public health problem generally believed to be fundamental if not elemental in character. So great a number of cases of what is believed to be one of the most easily prevented diseases in an enlightened community must necessarily put sanitarians and public health officials on their mettle.

All are familiar with how smallpox has been stamped out of the German army by systematic vaccination. There may be those who will say that it is much easier to eradicate this disease from an army where there is perfect control over all individuals than it is to accomplish the same result among civilians. This of course is to some extent true but in this connection it is worthy of note that some of our own states have practically eradicated smallpox from within their borders, and that the few cases which occur receive their infection from other states. What has been done in the Philippines is also of interest. The Director of Health of the Philippines in his annual report for the fiscal year 1907, states "During the year there has been unquestionably less smallpox in the Philippines than has been the case for a great many years previous. In the provinces of

Cavite, Batangas, Cebu, Bataan, La Union, Rizal, and La Laguna, where heretofore there have been more than 6,000 deaths annually from this one cause alone, it is most satisfactory to report that since the completion of the vaccination in the aforesaid provinces, more than a year ago, not a single death from smallpox has been reported. So thoroughly are the Philippines saturated with the contagion of smallpox that probably 25 per cent. of the residents would soon succumb to this disease if it were not for the ability to protect the inhabitants against it by vaccination."

VALUE OF MORBIDITY STATISTICS.

In the eradication of this disease, and the same is true of practically all others, the first essential is an accurate knowledge of its distribution and prevalence, a knowledge of the number of cases and where they are, in other words morbidity statistics. The states, therefore, which have appeared as having had a large number of cases do so because they have successfully recorded the cases and accomplished the first step in a successful campaign for the suppression of a disease. Other states have had few cases because they have gone one step further and successfully eradicated it. Still others appear to have had few cases, undoubtedly because they have not as yet started the campaign and have no reliable means of knowing the extent of the disease within their borders. It is to be expected that states where such conditions exist will undoubtedly harbor the disease for some time and be a constant source of infection to others.

Our chief and practically only aid in determining whether a disease is increasing or decreasing in frequency or remaining in statu quo is morbidity statistics. Without them we may form conclusions as to the prevalence of a disease by recourse to individual experience or general impressions, but these are usually inaccurate and certainly not to be depended upon. Mortality statistics are of service in determining the frequency of the diseases which have a uniformly high death rate. Unfortunately most of the diseases of greatest moment and interest to the health officer do not belong to this class. As an example of this may be cited the disease in question, smallpox, the death rate of which varies so markedly in different commu-

nities and in the same community during different epidemics. Broadly speaking all public health work depends on a knowledge of morbidity, for public health work is a fight against public morbidity.

The first step in a campaign against a disease should be to ascertain where it is and how prevalent. The health officer is greatly handicapped in his endeavors unless he possesses a knowledge of the existing morbidity of not only his own city or state but of that of his neighbors. A knowledge of morbidity gives to the health officer a basis for work, and to the community a knowledge of the need of sanitary measures. It must ever be largely true that the communities with the most exact knowledge of the prevalence of existing disease will be the ones to give their health officials the greatest moral support and to demand the most from them.

A community is usually reluctant to tax itself for the support of public health work unless it has a definite knowledge of its need.

The role played by morbidity statistics is at least twofold. First, they show the existence of diseases dangerous to the community, the need of immediate action, and where to act. In contagious diseases they reveal the foci of infection. Second, they serve for purposes of study and comparison, showing the efficiency or inefficiency of existing measures, and the need for others.

In conclusion it is desired to state that the completeness of the morbidity statistics collected by the Public Health and Marine-Hospital Service—and therefore their value—depends entirely upon the extent of the co-operation rendered by state and local health officers. Correlation of effort in this respect is necessary in order that accurate statistical information respecting smallpox and other diseases may be available.

INSANITY IN IMMIGRANTS.*

By P. H. BRYCE, M. A., M. D.,
Chief Medical Office, Interior, Ottawa, Canada.

The charge having been made in some quarters that there was an unduly large number of immigrants being admitted to Canada, who became subsequently or were at the time of admission insane, it became a duty to endeavor to determine as far as statistics were possible what the exact situation was.

For comparison, it was necessary that comparisons of populations be made as regards age periods, sex, nationality, etc., according to the last census. The population by age periods in the three countries was:

	England, Wales 1901		Canada 1901		United States 1900	
Under 15	32.4		34.0		34.4	
15 – 24	19.5		20.0		19.6	
25 – 34	16.1	47.8%	14.5	43.6%	15.9	47.6%
35 – 44	12.2		9.1		12.1	
45 – 44	8.9		11.5		8.4	
55 – 64	6.0	19.5%	8.2	25.3%	5.3	17.7%
65	4.6		5.6		4.0	

The notable differences at different age periods in Canada, especially as compared with either England or the United States, points to the fact that if a small population, as a Canadian Province or Eastern State, lost during a ten year period a notable number of its young population, or on the other hand had added to it an abnormal number, it must be apparent that the proportion of persons normally present in any age period would be notably altered. The first is the explanation of the excessive number of persons in the three later age periods in 1901 in Canada, which had for 20 years been losing to the United States a notable number of young men and women; while as will be seen in the figures for the three new Western Provinces, made

* Read before the Section on Vital Statistics, American Public Health Association at Richmond, Va., October, 1909.

up of a young population, the difference in the age periods in the 1906 census by an enormous immigration of nearly 100% over 1901, makes the variation from the normal even more marked. Thus:

Age Period	Canada 1901		Manitoba Saskatchewan Alberta 1901		Manitoba Saskatchewan Alberta 1906	
0 – 15	34.0		38.4		34.3	
15 – 24	20.0		19.2		21.4	
25 – 34	14.5	43.6	15.9	47.2	19.0	52.2
35 – 44	9.1		12.1		12.0	
45 – 54	11.5		7.0		7.3	
55 – 64	8.2	25.3	3.7	14.0	3.7	13.1
Over 65	5.6		2.3		2.0	

The causes of these differences are at once apparent if we note the number of children in an immigrant population. Taking the years 1905–6–7–8, it is found that of the 187,519 American immigrants to Western Canada there were of men 106,040, women 40,359, and children 41,090, or an average of 21.91% of children of 14 years and under, as compared with that in a normal population of 34%. This variation in the number of children is even more marked in the immigration from Europe, etc., to the United States, which was for 1904–1908 but 12.1% in a total of over 4,000,000.

Having these primary facts before me it became essential that in any study of insanity in a given population the number of immigrants in each age-period be carefully compared with its relative population, and as up to the end of 1908 the total immigration returns to Canada were available I attempted to study the effect of this immigration to the three North-West Provinces of Canada, whose population had increased by almost 150% between 1900 and December, 1908.

It was especially difficult to determine the true population of Canadians and Americans in these provinces, because a very notable proportion of the immigrants had been from Eastern Canada, and of those from the United States many were returned in the census of 1906 as "returned" Canadians, although in the immigration returns many of these were given as Americans.

Estimate had also to be made of the natural increase both in the population of 1901 and that of the immigrants of each successive year.

With the errors so far as possible eliminated in estimating population by nationalities, I was fortunate in being able to obtain a yearly return of the admissions into the several insane asylums from 1901 to 1908.

Admissions to Asylums in Manitoba, Saskatchewan and Alberta, 1900 - 1908.

	Total for 9 Years	Total of 1st 5 Years	Total of 2nd 4 Years
Canadian	759	353	397
English	353	146	207
Irish	80	29	51
Scotch	106	53	53
United States	149	42	107
Germany	56	23	33
France	53	24	29
British Possessions	13	4	9
Norway and Sweden	133	54	79
Austria	145	55	90
Russian	95	43	52
Italy	3	1	2
China and Japan	6	1	5
Unknown	31	4	27
Total	1982	840	1142

Comparing the admissions at the end of 1900 with those at the end of December, 1908, the fact is found that in one of the two asylums 40% of those present in 1900 were still inmates in 1908, and in the other 61%, indicating not only the probably young age at which such were admitted, but how without any per 1,000 increase of insane, asylums do rapidly fill up. That is, with a total of 407 in the asylums in 1900 there were, including those, to the end of 1908, 1,982 admissions; but with a population increased by 150% in 1908 as compared with that in 1900, the admissions were 358 as compared with 142 or estimated per thousand population the admissions in 1908 were .335, while those admitted in 1901 were .339 per 1,000.

It is of importance as regards the number of immigrant insane that the Canadians in the population of 1901 were 62% of the

total population and in 1908 but 54%. If a larger group be taken, as the first five years compared with the latter four years, which, with a population of just 1-7 more persons had 1,142 admissions as compared with 840 or with 961 if the population be made of the same ratio, it appears that there is a slight increase; but it will be observed that the movement of a portion of the 38% of the total population from below the 15 year age period to that between 15 and 24, which was 8% of the total admissions in any year, and of those between 50 and 60 to the period beyond that, will fairly account for this increase. If we turn to the rate per 1,000 of admissions of different nationalities for the nine years and reduce them to an average for one year we obtain the following:

Nationality	Population	Admission per 1,000 to N. W. Asylums average of 9 years reduced to one year
Canadians	461,229	0.19
British Islands	185,401	0.32
British Possessions (total 1,533)	1,533	0.94
United States	218,347	0.076
Germany and Holland	18,132	0.34
France, Belgium and Switzerland	28,711	0.52
Austro-Hungary, Galicia, etc	85,091	0.18
Russia and Finland	47,206	0.22
Italy and Spain	2,134	0.16
China and Japan	1,464	0.45
Others	1,497	2.30

What is worthy of remark in those tables is the relatively low rate of native Canadians and of Americans; but it must be remembered that of the latter probably a larger percentage are of Americanized Germans, Scandinavians and their families than of the old Anglo-Saxon stock.

However, it has been remarked by others as well as by myself that the Teutonic peoples, both German and Scandinavian, have in America a relatively high number of insane. What further is equally notable is that the Slav races, whether native Russians or Galicians, Poles, etc., have year in and year out a remarkably low percentage of insane, and the same may be said especially of the Italians.

Another rather remarkable fact is shown by the tables, viz., that of 1,982 admissions to these asylums, 1,274 were men and 708 were women. Compared with the ratio per capita, it is found that while males to females in the population were:

Census	Males	Females
1901	54.6%	45.4%
1906	57.6%	42.4%

The ratio of admissions was:

1901	64%	36%
1906	66%	34%

The idea that life on the wide western prairies is especially fatal to the healthy mentality of women seems absolutely without foundation, and is, I trust, permanently exploded.

To make our tables yet more valuable I may give the ratio per 1,000 of admissions to the asylums of these Provinces: Averaged to a rate per 1,000 population for one year

Age-periods	Ratio per 1,000 population at each age period
15 – 24	0.11
25 – 34	0.52
35 – 44	0.66
45 – 54	0.72
55 – 64	0.70
65 and over	1.05

The comparison of the percentage of admissions as compared with the percentage of population for the same period to the total is of much interest: For 1901–1906 the admissions between 25 and 44 were 58% of the total compared with 44.2% for the same period in English asylums. For the period over 44, the percentage is 33% of the total as compared with 39.8 for English asylums. If we take the population percentage for the same age period 25–44 we find in the Northwest Provinces it was 31% of the total as compared with 28.3 in England.

What however, is very remarkable is that while in the Northwest Provinces the percentage of admissions between 15–24 was but 7% of the total, while the population was 21.4 of the total in 1906, the admissions in England were 13.4%, although the population was but 19.4% of the total over 15 years. It would appear that the mental breakdowns in England were

greater in the early period of life, and thus would reduce somewhat the number of insane in later periods.

In the period between 25 and 44 the figures for New York State show a similar rate to that of England. Assuming the great difference to be real and not accidental is it to be explained by the great difference due to the high proportion urban to rural population in the two latter cases? These comparisons have an important bearing upon the total insane in any population, since while a high percentage, if under 15 years, tends to lessen the total admissions over a low percentage of population in this period and a relatively high population in the years beyond 45 years tends to increase the total admissions, yet it is the population in the years 25–45 of stress, wage-earning and child-bearing, which tells most directly in the total admissions.

As we have already seen the percentage of the total population in England between 25–44 was nearly 5% greater than in Canada in 1901, but is almost exactly the same as in the United States in 1900. Hence it will be of interest to compare the rate per 1,000 of admissions in the three countries.

The following table taking New York State figures is illustrative:

	N. W. Canadian Provinces 1900 to 1908 (average)	England 1902 to 1908 (average)	New York State 1904
Under 15	....	0.03	0.006
15 – 24	0.11	0.46	0.7
25 – 34	0.52	0.93	1.2
35 – 44	0.66	1.22	1.49
45 – 54	0.72	1.37	1.80
55 – 64	0.70	1.36	2.00
65 and over	1.05	1.53	2.80
Unknown age	....	....	6.00

Owing to the age-periods from which the figures of 1901 Census for all Canada are given they are not exactly comparable with the above; but the total insane was 3.07 per 1,000.

Accepting the figures for England as a standard we find that 0.5 or one in 2,000 population were admitted in a year to asylums there. If the population for New York be taken for 1900 as a divisor then the admissions taking these for 1904 were 0.91 per 1,000 annually, but if we take the population increase of New

York Cities for the 4 years as it was, at 10% then we may reduce this to 0.80 per 1,000.

The admissions for the Northwest Provinces with their 150% increase, chiefly through immigration, reduced to an average, give 0.27 per 1,000 or about one-third those of New York and one-half those of England.

To illustrate how much care must be taken in comparisons the following table is given of the official insane in different countries:

Country	Year	No. per 1,000 in Asylums	Class of Included
England	1903	3.40	All notified lunatics.
Scotland	1903	3.63	All in asylums, prisons, etc.
Ireland	1903	4.90	Does not include those in private houses.
Canada	1901	2.38	All present during census year.
France	1904	1.77	Inmates of all institutions.
Germany	1903	1.91	Inmates of all asylums.
Norway	1902	0.80	Inmates of all asylums 2.35 by enumeration.
Sweden	1903	0.97	1.54 official insane notified.
Denmark	1901	1.40	1.71 official insane.
New York State	1903	3.39	All inmates of asylums at a fixed date
Massachusetts	1903	2.88	All inmates of asylums at a fixed date
Michigan	1903	2.15	All inmates of asylums at a fixed date
Wisconsin	1903	2.47	All inmates of asylums at a fixed date
Minnesota	1903	2.13	All inmates of asylums at a fixed date
Austria	1901	0.51	In asylums.
Italy	1899	1.09	In asylums.

How inadequately expressed is the exact situation as judged by these figures may be judged by the fact that in those western states, Wisconsin and Minnesota, where the foreign population in 1900 was 60%, chiefly Teutonic, and a young population the asylum admissions are greater than in Germany, three times as great as Norway and Sweden; while they are four times greater than in Austria, and twice that of Italy.

It will be recalled that in the Canadian West the Teutonic immigrants admitted to asylums per 1,000, averaged for Germans 0.34, Norway and Sweden and Denmark, 0.52, so that it is plain that the clearest distinction must be made in comparisons, between the official insane, and the insane by census enumeration. Further, it must not be forgotten that it is only the 15–24

year age period, of all ages prior to 25 in which insane are found, so that an immigrant population with its relatively low child population will always show higher in the rate per 1,000 of population than it normally should.

How hospital and asylum accommodation is the chiefest factor in increasing the asylum population is seen in different states. Thus, from 1880 to 1903, the ratio of increase of insane in the asylums of New York was 62.5%; Wisconsin, 35.9%; Minnesota, 66.5%. The latter, however, was relatively lower to start with in 1880, the rate being 1.46 as compared with 2.76 in 1903. The comparative study must, however, be much further refined if we wish accurate information. Thus the statistics of the Metropolitan Asylums of London for 1907 are most instructive. Patients admitted were: 5,285 (but if corrected for transfers from one asylum to another is 3,554). This made an actual decrease of 43 over 1906. Of the attacks in 1907:

1,512 were first attacks of less than 3 months' duration.
417 were more than 3 and less than 12 months' duration.
651 were not first attacks of less than 12 months' duration.
46 were less than 12, but not known if first attacks.
522 were more than 12 months' duration.
278 were of unknown duration.
126 had congenital signs of insanity.
6 not insane.

The percentage of first attacks to total admissions in 1907 was 55.3%.

In pursuing my investigations into the asylums themselves in Canada I found that the transfers and repeated admissions of the same person, as is seen in London practically precluded the use of the year by year admissions as a basis of accurate comparison. But apart from this the problem especially in the older provinces was complicated by the fact that the place of birth if outside Canada caused the insane person to be registered as foreign-born, and he was often classed as an immigrant without the fact being mentioned that he was admitted perhaps as a senile dement of 70 years and had been 50 years in the country.

Again in certain of the asylum districts into which for Departmental purposes Ontario is divided, the population is largely rural and has had between 1900 and 1908 few immigrants. In

such it was found that the native born Canadian in 1905–1908 gave a higher percentage of admissions than in 1901–1904, or 90% in the latter as compared with 77.7% in the former in the Brockville district. Superficial examination would lead us to the conclusion that the native-born Canadians were becoming increasingly insane; whereas, the fact really is that year by year the old settlers, foreign-born, are dying off and the native born is yearly increasing in the population. The same was shown in the French-Canadian population in the asylums of Quebec. The fact is that a study of the insane in the foreign-born in America is only of any value where it is taken as we have done in Manitoba and studied it by age-periods. This was especially seen in Ontario where there are eight asylum districts and comparisons of admissions to each of these by ages was made. For instance, the Toronto district which probably receives 50% of the annual immigration to the province, as New York City does, was compared with the old-settled Brockville district. The admissions in Toronto per 1,000 were higher in the youngest population period and in the oldest in Brockville than in any of the other districts. But while Toronto had nearly 50% more per 1,000 population for the age period 15–24 than Brockville, the latter had actually four times as many admissions per 1,000 for the period over 65 years as Toronto.

What is further of great interest is that the Northwest Provinces with a population increase in eight years of 150% mostly by immigration as compared with that to Ontario of but one-tenth of the population had but slightly more insane in the 15–44 age period than in 1900, this being that to which immigrants almost wholly belong.

The total admissions to Ontario asylums in 1907 over 1905 was but 47, while outside of Toronto there was, in five asylums, an actual decrease of 31 admissions. As a matter of fact there seemed but one province, that of British Columbia, where during the four-year period of 1904–1908 the increase in admissions to the asylum of English born immigrants seemed disproportionate to the total of immigrants who are known to have entered the province.

But the subject is one of extreme importance, and the existence and enforcement of immigration laws are alone likely to prevent the ingress of persons who are undesirable aliens.

The Massachusetts Association of Boards of Health

JANUARY QUARTERLY (and ANNUAL) MEETING
Boston, Massachusetts

The quarterly (and annual) meeting of the Massachusetts Association of Boards of Health was held at the Brunswick Hotel, Boston, on Thursday, January 27, the President, Dr. Henry P. Walcott, presiding. Dr. Wood, Dr. Tobey and Dr. Chapin were appointed a committee to nominate officers for the ensuing year. The following persons were elected to membership:

Dr. M. H. Bailey, of Cambridge;

Dr. Henry C. Luce, of the Marion Board of Health;

Dr. Henry L. Dearing, of the Braintree Board of Health;

Herbert E. Bowman, Inspector of Milk, Somerville;

Dr. T. W. Murphy, of the Lawrence Board of Health;

Michael J. Coughlin, of the Fall River Board of Health;

Dr. David Townsend, of the Boston Consumptives' Hospital, Mattapan;

Dr. M. J. Rosenau, of the Harvard Medical School;

Miss Ida M. Cannon, Head of Social Service Work, Massachusetts General Hospital, Boston;

Dr. F. A. Sullivan, of the Haverhill Board of Health;

Dr. Frederick H. Thompson, Sr., of the Fitchburg Board of Health;

Dr. Josiah O. Tilton, of Lexington;

Dr. Nelson C. Davis, of Dorchester.

The Treasurer's report for the year follows:

REPORT OF TREASURER FOR 1909.

RECEIPTS.

Balance from 1908	$1,464.37
Received Annual Dues for 1908	48.00
Received Annual Dues for 1909	553.00
Interest Central Savings Bank, Lowell	53.04
Total Receipts	$2,118.41

EXPENSES.

Printing for Secretary and Treasurer	$ 27.50
Postage	48.52
Cigars and Dinners for Guests	42.72
Clerical Assistance	29.25
Treasurer's Bond	4.00
Stenographic Report of Meetings	128.34
Journal	313.00
Legal Expenses	20.00
Committee Expenses, mostly Printing	121.40
Total Expenses	$ 734.73
Balance to 1910	1,383.68
	$2,118.41

Of this balance, $1,366.53 is drawing interest in the Central Savings Bank, Lowell.

Respectfully submitted,

JAMES B. FIELD, Treasurer.

Examined and approved as correctly cast and properly vouched for. J. ARTHUR GAGE, Auditor.

Jan. 24, 1910.

Dr. FIELD. The most unfavorable feature of the Treasurer's Report is that our annual dues have failed to pay our current expenses by $133.73, and we have had to draw upon our surplus for that amount. This is largely due to the printing done by various committees. The expenses exceeded dues in 1907 by $31.61, in 1908 by $118.32, and in 1909 by $133.73. If we increase expenses in this ratio, in five years we cannot pay our bills.

The Association has completed its 20th year. Seven of its original members are still borne on the rolls: The President, First Vice-President, Secretary, and Treasurer, also Mr. Cosden of Boston, Dr. Croston of Haverhill, and Dr. Gage of Lowell.

Eighty-three members paid dues the first year, 301 members paid dues the 20th year.

The struggling JOURNAL of our early years has become a financial and journalistic success, while the Association has tremendously broadened its work and usefulness.

The report of the Treasurer was received and placed on file.

The Committee on Milk Legislation, which was asked at a previous meeting to draw up a set of model regulations for general adoption by the Boards of Health of cities and towns throughout the state, presented the following report:

Report of the Committee on Milk Legislation.

1. No person, firm or corporation shall engage in the production, sale, delivery or distribution of milk in the city of .... (or town of..........), except in accordance with the provisions of the Revised Laws of Massachusetts, and of acts of the legislature additional thereto or in amendment thereof, and in compliance with the following rules and regulations of the Board of Health of said city.

2. Every person, firm or corporation producing, keeping or offering for sale milk in the city of .... (or town of ....), shall annually, before the first day of June, be licensed so to do by the milk inspector of said city.

3. No milk shall be produced, kept, sold or offered for sale in the city of .... (or town of ....), from any cow or cows that are not properly cared for or that have not, within one year, been examined by competent authority and certified to be free from all diseases dangerous to the public health; or that are kept in a stable that is not in a clean, healthful and sanitary condition and that is not open to inspection by the Board of Health or the Milk Inspector at all times.

4. No milk shall be produced, kept, sold or offered for sale in the city of .... (or town of ....), unless it has been strained, mixed and cooled immediately after it is drawn from the cow; said milk shall not be strained, mixed or cooled in any room which is not provided with tight walls and floor or such construction as will allow easy and thorough cleaning or which is not kept constantly clean, or which is occpuied by horses, cows, or other animals, or in any room which is used in whole or in part for domestic or sleeping purposes unless the storage room for milk is separated from the other parts of the building and provision made for the exclusion of outside dust and flies to the satisfaction of the Board of Health.

5. Milk kept for sale in any shop, restaurant, market, bakery or other establishment shall be stored in a covered cooler box or refrigerator. No vessel containing milk for sale shall be allowed to stand outside of said cooler box or refrigerator except while a sale of said milk is being made. Every such cooler box or

refrigerator shall be properly drained, cleansed and cared for, and shall be kept tightly closed except during such intervals as are necessary for the introduction of milk or ice, and shall be kept only in such locations as shall be approved by the Board of Health.

6. The Milk Inspector shall under the direction of this Board, investigate and take samples to determine the quality of the milk sold, offered or exposed for sale or intended for sale in this city, and he shall make or cause to be made examinations and inspections thereof to ascertain whether or not adulterated or impure milk is sold, kept, offered or exposed for sale or intended for sale in said city contrary to the Statutes of this Commonwealth, or to the provisions of these rules and regulations. He shall visit dairies supplying milk in, and to the inhabitants of the city of .... (or town of ....), and all places where milk is stored, kept or offered for sale, as often as deemed necessary by this Board, and, he shall report the conditions thereof at the time of such inspection, in writing, to this Board. He shall act as agent and prosecuting officer for the Board of Health in all matters pertaining to milk.

7. All cans, bottles or other vessels of any sort used in the production, storage, sale or distribution of milk in this city shall be cleaned and sterilized with boiling water or steam before they are again used for the same purpose, and all cans, measures or other utensils made of metal shall be kept free from dents and rust, and there shall be proper appliances for washing all utensils used in the production, mixing, storage, sale or distribution of milk, and all such utensils shall be washed, cleaned and sterilized with boiling water or steam regularly after being so used. The filling of bottles with milk intended for sale, excepting at a dairy or creamery, is prohibited.

8. The water used in washing apparatus and utensils must be from a public water supply, or if from any other source, its use must be subject to the approval of the Board of Health.

9. No milk shall be brought into or carried within the city of .... (or town of ....), for the purposes of sale which has been carried upon any wagon or vehicle which is not clean and free from offensive odors, or upon which swill, refuse, garbage or decaying, unwholesome or filthy matter is carried.

10. No person, by himself or by his servant or agent, or as the servant or agent of any other person, firm or corporation, shall, in the city of .... (or town of ....), sell, exchange, or deliver or have in his custody or possession with intent to sell, exchange or deliver, any milk, skimmed milk, or cream, which contains more than 500,000 bacteria per cubic centimeter, or any pathogenic micro-organism.

11. Every person engaged in the production, storage, transportation, sale, delivery or distribution of milk for sale in this city shall notify the Board of Health immediately on the occurrence of any case or cases of infectious disease, either in himself or his family, or among his employees, or their immediate associates, or within the building or premises where milk is stored, sold or distributed, and at the same time shall suspend the sale or distribution of milk until authorized to resume the same by the Board of Health. No vessel which has been handled by a person suffering from a disease or which is on the premises of a person in whose family or household infectious disease exists shall be removed to hold or convey milk until it has been thoroughly disinfected and sterilized under the supervision of an agent of the Board of Health.

12. Bottles or other milk containers shall not be left with any family in which there is any contagious disease, but milk may be delivered to such families by pouring into vessels furnished by said families. No bottles or other container, previously left with any family in which a contagious disease occurs, shall be removed therefrom except with the consent of the Board of Health in writing.

13. For the purpose of enabling the Board of Health to carry out and enforce the provisions of these rules and regulations, the Milk Inspector, acting as the authorized agent of, or any other qualified inspector or agent of the Board of Health, or any member of said Board, shall, at all times, have free access to all barns, stables, dairies, creameries, stores, wagons and all other buildings or premises in which cattle are kept, from which any part of the milk supply of the city of .... (or town of ....) is obtained, or in which milk is received, kept, bottled, canned or offered for sale, for the purpose of making inspection of said premises, cattle, vehicles, cans, vessels, measures and other utensils used in conducting the handling, sale and delivery of milk, and for the purpose of taking for analysis or other tests to determine its quality samples of the milk kept or intended for sale in the city of .... (or town of ....).

14. Whoever tests milk or cream which is to be offered for sale in any form by tasting shall do so by means of a spoon or piece of wood, paper, cardboard or other article, and such spoon, piece of wood, paper, cardboard or other article shall not again be brought in contact with the milk intended for sale, or be used for testing milk until after being thoroughly washed and sterilized; no person shall permit his hands, fingers, lips or tongue to come in contact with milk intended for sale in any form. All persons engaged in the tasting, mixing or handling of milk for sale in any form shall before engaging in such tasting, mixing or

handling, thoroughly clean his hands and finger nails and keep them clean and dry during such tasting, mixing or handling. No person shall permit his hands while wet to remain or pass over any open vessel containing milk intended for sale in any form. No person shall fill a jar, can or other receptacle with milk while the aforesaid jar, can or other receptacle, is held over an open vessel containing milk intended for sale in any form. No person who has sore throat, diarrhoea, or is suffering from any other disturbance of the bowels, or has symptoms of infectious or contagious disease, shall engage in the handling of milk which is to be offered for sale or which is for sale.

15. No urinal, water closet or privy, shall be located in rooms in which milk is handled, or so situated as to pollute the atmosphere of said rooms.

16. Dealers in milk are prohibited from allowing any person or persons not in their employ to loiter about the milk room or handle any vessel or utensil used in the sale or distribution of milk.

17. Every person, firm or corporation in the city of .... (or town of ....), engaged in the sale, delivery or distribution of milk from dairies, shall, upon request from the Board, certify that the above rules are complied with by said dairies.

GEO. E. BOLLING, *Chairman.*

The report of the Committee was accepted and ordered printed, the Committee being instructed to watch all milk measures introduced during the present session of the legislature.

Mr. BOLLING. Last year we got through the legislature, and had it made a law, a transfer in the appointment of milk inspectors to Boards of Health; and the Senate foisted upon us an amendment whereby the Boards of Health of towns had no voice in determining the compensation. So we have put in another bill this year, a bill we hope may be made an Act, House Bill No. 512, whereby the Boards of Health of towns are granted the right of fixing the compensation of their milk inspectors. So everyone who represents a town Board of Health should assist in the passage of this bill, which places towns and cities on an equal footing. Some difficulty has occurred in one place, at least. The milk inspector of the town of Westfield had to serve without any compensation whatever, because the selectmen saw no need of inspection. There may have been other instances. That is one we know of.

The Committee on Nominations reported as follows:

For President, Dr. Henry P. Walcott, of Cambridge.
For First Vice President, Dr. S. H. Durgin, of Boston.
For Second Vice President, Dr. C. V. Chapin, of Providence.
For Secretary, James C. Coffey, of Worcester.
For Treasurer, Dr. James B. Field, of Lowell.
For the Executive Committee, for two years: Dr. L. M. Palmer, of South Framingham; Dr. F. G. Wheatley, of North Abington; Dr. John F. Worcester, of Dorchester; Dr. J. J. Goodman, of Clinton; Dr. J. P. Schneider, of Palmer.

PRESIDENT WALCOTT. I am very much disappointed in the report of your Committee. I supposed it was distinctly understood that my term of service was at an end here. I intended it should be. I don't wish to interrupt the harmony of the proceedings, gentlemen, if you have got so far. I wish to have it distinctly understood, however, that I don't intend to block the way here forever, and that this is my last year, positively.

(The Secretary was instructed to cast one ballot each for the nominees, as read.)

Report of Committee on Sex Hygiene.

During the year we have continued to print and distribute Circulars 1 and 2 throughout the state and to an extent exceeding 55,000. We have also issued a circular for women known as No. 3, of which 10,000 have been distributed.

The demand for them is continuous from ministers, school principals and superintendents, physicians, dispensaries, (such as Mass. Gen'l Hosp. O. P. D. and Boston Dispensary), certain public school Parents' Assns., Y. M. C. A.'s, Y. W. C. A.'s, labor unions, and individuals. We have at present requests for several hundred which we are unable to supply because we could not reprint without exceeding the appropriation made by you. The different items of the program adopted two years ago have been advanced as time and opportunity permitted.

We were instrumental in securing and organizing the great public meeting under the auspices of the State Charities Conference and through our initiative its proceedings will be published and distributed free—the funds having been raised by a man who first knew the importance of the subject through one of our circulars distributed at the 1915 Exposition.

We have co-operated with the Mass. Comm. on the Blind, the Boston Bath Dept., and other agencies through whose united efforts the beneficent objects of the committee will ultimately be obtained.

If the work of the committee meets with your approval it respectfully suggests that its report be accepted as progressive and that the usual appropriation of $250.00 be made for its continuance during the year ahead.

Respectfully submitted,

Dr. Louis M. Palmer,
Dr. Gardner T. Swartz,
Dr. H. Lincoln Chase,
Walter E. Kruesi, *Sec.*

It was voted to accept the report and place it on file, and to refer the request for an appropriation to the Executive Committee.

AN IMPROVED BUBBLING DRINKING FOUNTAIN.

By Mr. SIMEON C. KEITH, JR.,
Boston, Mass.

As is well known, the bubble type of drinking fountain has of late been widely adopted by the more progressive cities and towns for use in schools and other public places. This type of fountain displaces the common drinking cup, which, as is well known, is liable to spread disease. In the bubbling fountain the water is discharged upward in a short stream from a nozzle so that a person may drink the water as it emerges therefrom. The continuous flowing type seems to be the one most generally favored for the reason that the water continually washes away any bacteria which may be left by the person last drinking.

In the practical use of such a fountain, however, a difficulty has arisen from the fact that the pressure of water in the service pipe supplying the fountain varies to a very great extent, especially on the upper floors of buildings, on account of the fact that water is delivered to sinks, water closets and wash basins from the same source, the water being largely reduced in pressure each time one of the latter is in use, and consequently the height of the stream or bubble varies from time to time. In a school, for instance, the height of the bubble is regulated by a throttling valve when the toilet rooms are not in use, and hence at recess, when the water closets require a constant flow of water and the fountains are most in demand, the bubble or jet is reduced to its minimum. On the other hand, were the height of the bubble to be adjusted when the other fixtures in the building are being used, the pressure in the fountains at normal periods would be so great that the jet or bubble would rise to too great a height and much water would be wasted; as well as the fact that the high jet is an unsatisfactory one to drink from. The object of the present invention is to provide such drinking fountains with means for regulating the water pressure, so that the height of the bubble or

jet will remain constant at all times, regardless of the varying pressure in the service pipe. To this end I have interposed between the nozzle of the fountain and the service pipe a reducing valve which is operated by the water pressure to vary the opening in a port leading to the nozzle so that the flow of water being delivered to the nozzle will be automatically equalized.

It will be apparent that the invention may be utilized in various standard fountains which are supported by columns or otherwise. The construction of the device is most simple. It consists of a cup or bowl cylindrical in shape and provided with a cap having an opening of a size to produce a jet suitable for fountains of this type. The lower end of the cup is reduced and provided with a threaded portion which may be screwed into the service pipe. Inside the cup is an accurately fitted brass piston carrying a small plunger, the lower end of which fits a hole in the bottom of the cup, leading to the service pipe, so that when the piston is in its upper position in the cup, the water supplied from the service pipe will be entirely cut off. A portion of the plunger, however, is cut away, so as to make it cone shaped; consequently, when the piston is in the lower position in the cup, the plunger is carried down through the opening to a point where there is a large annular opening to the service pipe. The piston with its plunger is normally kept in its lower position by a small brass spiral spring. The piston has an opening through it, and this opening can be varied by means of an adjusting screw so that the water entering into the lower chamber from the service pipe passes through the opening in the piston into the upper chamber, from whence it emerges through the nozzle in the cap to form the drinking jet. When connected with service pipe, the operation is this: Water rushes into the lower chamber, forcing the piston upward against the spring to such a point that the pressure of water against the piston exactly balances the pressure exerted by the spring. In the upward travel of the piston the annular opening to the service pipe is reduced by the attached conical plunger to a point where the flow of water is just sufficient to maintain this balance. If the initial pressure is high the piston is forced upward so that an exceedingly small annular opening is left around the plunger.

As the pressure is reduced in the service pipe, it requires a larger opening for the water to exert the same pressure on the piston. The spring, therefore, forces the piston downward, increasing the annular opening to a point where the flow or water is sufficient to again balance the pressure of the spring, consequently a uniform pressure of water is maintained in the lower chamber.

It must be borne in mind that water is constantly flowing from the lower chamber to the upper and that this flow will be constant as long as the pressure in the lower chamber is constant.

THE IMPORTANCE OF REGISTRATION AND CONTROL OF CASES OF LARYNGEAL AND PULMONARY TUBERCULOSIS.

By DR. DAVID D. BROUGH.

The belief that consumption was a communicable disease was entertained long before there was any scientific demonstration of the fact. In Italy this opinion was held in the eighteenth century. The work of Laennec on diseases of the chest in the early part of the last century, and the discovery of the stethoscope are important epochs in the progress of our knowledge of the disease.

In 1865 Villemin, in France, proved that pulmonary tuberculosis was transmissible from man to animals by inoculation experiments. *Herard & Cornil called attention to the transmission of phthisis by close association. Louis believed that 90% of phthisis was acquired and only 10% of hereditary origin.

In 1875 a medical commission appointed by the Boston Board of Health stated in their report of consumption: †"It is a disease of which the causes are to a considerable extent undeniably subject to control and removable by measures of both public and private hygiene." The report calls attention to its prevalence among certain nationalities, the influence of damp and unsanitary dwellings, privation of fresh air and sunlight, the danger from dark and ill ventilated lodging houses, the evils of intemperance, and the effects of indoor occupations. It calls attention to the lowered death rate in English towns from consumption by improved sanitation, and very pertinently asks why similar results should not be attainable in Boston. None of these preventable causes would be denied even with our advanced knowledge of today. How judiciously the subject was considered is seen in the result in Boston at the present day, 35 years after.

* De La Phthisis Pulmonarie (Paris, 1867).

† The Sanitary Condition of Boston, 1875.

There has been for the last fifty years a steady decline in the number of deaths from consumption relative to the population. This has been marked not only in this State and City, but in many other cities of the United States and Great Britain, and elsewhere. A glance at the Tuberculosis charts for the last fifty years clearly shows this.

Various agencies combined to produce this result long before the active crusade began. Chief among them has been the great improvement in sanitation in cities. Improved sewerage and water supplies, new methods of lighting, heating and ventilation, have had an important influence. The constant work carried on by the Health Departments against damp and unsanitary houses and alleys, and against the dark and airless sleeping rooms, must have had some effect. The regulations against overcrowding, against the smoke nuisance and dust, the inspection of dangerous occupations, the adoption of devices for protection in dirty and dangerous trades, have been movements for protection from tuberculosis, even though they were not adopted for that purpose. The great movements for temperance and better living have been very important factors. It was not until 1882, when Koch discovered that tuberculosis was caused by a living micro-organism, the tubercle Bacillus, that consumption was placed absolutely in the class of communicable diseases. The term communicable seems more suitable to apply to consumption than "infectious." The term "infectious" tends to convey to the mind a disease like smallpox, measles, or scarlet fever, an idea which it is not desired to imply in tuberculosis.

The cause of tuberculosis has been definitely established. Under what circumstances can it be communicated?

Among veterinarians and students of the diseases in animals there is a strong opinion, as seen in the writings of Salmon, Ravenal, Behring, and others, that much of human tuberculosis comes from animals. They give great weight to the ingestion theory that the tubercle bacilli are carried into the system through uncooked meat or milk and then carried through the lymphatic system to the lungs, and that much of the pulmonary tuberculosis is caused in this way.

Most health boards, while not denying that animal tuberculosis may be communicated to man, are inclined to regard this

method as a small factor in the spread of pulmonary and laryngeal tuberculosis. They agree generally with the opinion expressed by Koch in the London Congress of 1901, which opinion is shared by many eminent bacteriologists, and by specialists in the disease, that human tuberculosis comes chiefly from man. In the Report of the Medical Officer of Health of Calcutta (1903), consumption is shown to be prevalent among Hindoos who by their religion are forbidden to eat meat. In Japan there is tuberculosis though raw cow's milk is rarely used by the great mass of the people.

The concensus of opinion among health officials as expressed in their circulars is that consumption is a preventable disease which is caused by the tubercle bacillus, a living organism which enters the body by the medium of the inspired air. Practically all observers agree that human sputum from a tuberculous case is the main cause of tuberculosis. It is not the moist sputum that is dangerous, but only when it dries and is inhaled. Sputum may be dangerous when coughed in small droplets and inspired.

The organisms when exposed to direct sunlight are killed in a short time. Expectoration out of doors in the gutter or street, when not walked on or carried on the clothes or shoes is not of especial danger. The sputum deposited within doors or on handkerchiefs and allowed to dry constitute a real danger. The organisms live in the dried condition for a considerable time, varying with different observers from six weeks to eight or nine months, or even more. The dust from floors and walls of rooms occupied by consumptives has been repeatedly proved to be infected. *Dr. Flick and others attach the greatest importance to house infection.

If rooms are infected by a living organism it is plainly the part of preventive medicine to make them safe for subsequent occupants. It is hardly within the scope of this paper to discuss what methods of disinfection are best. That there is a real reason for disinfection is apparent. In order to accomplish any result there is need to obtain knowledge of the individual case. Notification is thus absolutely necessary. By Notification and Registration of Tuberculosis reference is made only to pulmonary and laryngeal tuberculosis. These include 90% of all cases.

* Flick Maryland Med. Journal, Feb., 1904.

Tuberculosis of the glands, of the bones, of the joints, of the genito-urinary organs, of the kidneys, of the meninges, and of the skin, can hardly be regarded as constituting any real menace.

To require all these forms to be reported would only complicate matters that are intricate enough at present. It would necessitate different methods of action for the different classes. Until more definite knowledge is obtained we should concentrate our activities against a known means of infection and not waste them on uncertain and indefinite possibilities.

Compulsory notification should be applied to laryngeal and pulmonary tuberculosis and to the other forms only when they are associated with these forms of the disease.

Notification means compulsory notification. Voluntary notification has been tried in British cities and has not proven effective.

The idea of reporting cases is not new, though the general application is of recent growth.

In 1782 the Government of Naples required physicians to report every case of consumption which came to their knowledge, with a fine (of 300 ducats) for the first offense and banishment for ten years for the second. There are other regulations drawn up by this Government that read like the orders of the most advanced Health Board of the present day. The authorities were required to tear out and replaster houses occupied by a consumptive, from garret to cellar, the sick poor were to be removed to a hospital, the superintendent of the hospital was required to keep in a separate place the clothing and bedding for the use of consumptives. There are other orders for the disposition of clothing and susceptible household goods.

Notification was recommended by the International Medical Congress at Paris in 1888 and 1893 and in the London Congress of 1901. It is favored by nearly all medical bodies and specialists in the disease. The reasons for reporting cases were carefully stated in a paper by Dr. E. O. Otis before this Association in April, 1908.

In an article written in 1893, *Dr. James B. Russell, of Glasgow, states that he was not aware of any country or place where this had been done."

* Prevention of Tuberculosis.

There has been a great change since then. I have communicated with the health boards of forty of the largest cities of the United States and Great Britain. In the United States, January 1, 1910, thirty-three report that notification of pulmonary and larygneal tuberculosis is required, and in only two is there no requirement. The seven cities in Great Britain have some form of notification, compulsory in some instances, voluntary in others, some a mixed system of voluntary and compulsory, depending on the class of patients.

Registration of pulmonary and laryngeal tuberculosis was required by law in Michigan in September, 1893, and somewhat later in New York State. In most of the cities it has only been adopted during the last seven years and in some within the last year.

In all these cities except four disinfection is required. In one nothing is done and in the other three disinfection is performed on request.

Compulsory notification of pulmonary and laryngeal tuberculosis began in Boston in May, 1900. I have sent inquiries to various cities to find what proportion of the estimated cases in each city has been reported. The replies are to January 1, 1910:

In two cities 90% are estimated reported.
In one city 80% are estimated reported.
In one city 65% are estimated reported.
In three cities 60% are estimated reported.
In two cities 50% are estimated reported.
In one city 38% are estimated reported.

In the remainder (24) the proportion runs from 33% to 5% of the estimated number of cases. In Boston about 70% of the total number of cases are estimated to be reported. The estimate is made on the death returns of pulmonary tuberculosis for 1909. Seventy per cent of the deaths that come to the office are found to have been previously recorded. This is a fair method of estimating.

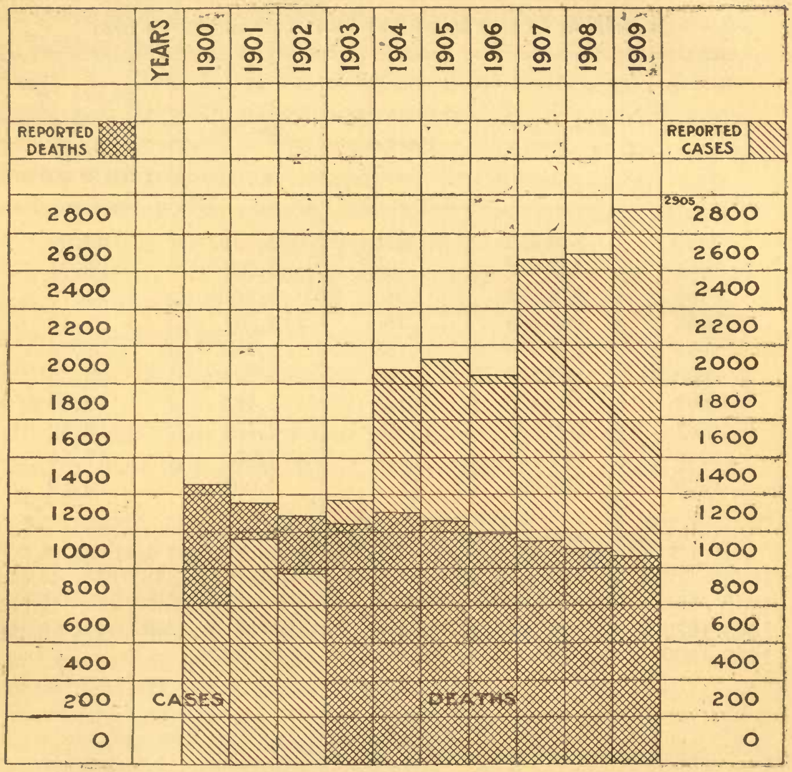
In the cities where the best results have been obtained a vigorous campaign has been carried on to get the cases reported. It is only by strenuous effort that definite results are obtained.

Phthisis Pulmonalis—Reported Cases, Deaths, Rates of Deaths to 10,000 Inhabitants and Population in Boston.

YEARS	POPULATION	REPORTED CASES	DEATHS	RATES OF DEATHS PER 10,000 INHABITANTS
1900	560,892	815	1,407	25.08
1901	567,617	1,149	1,346	23.71
1902	574,465	944	1,247	21.70
1903	581,359	1.355	1,227	21.10
1904	588,320	2,138	1,280	21.76
1905	595,380	2,168	1,224	20.56
1906	602,526	2,131	1,185	19.67
1907	609,757	2,623	1,123	18.42
1908	617,144	2,646	1,068	17.30
1909	624,574	2,905	1,055	16.89

In previous years commencing with 1846 the average death rates per 10,000 living in five-year periods were as follows: 1846–1850, 44.50; 1851–1855, 47.36; 1856–1860 (four years), 45.08; 1861–1865, 42.27; 1866–1870, 38.13; 1871–1875, 40.34; 1876–1880, 37.45; 1881–1885, 40.91; 1886–1890, 35.44; 1891–1895, 28.88; 1896–1900, 24.05.

PHTHISIS PULMONATIS. CASES AND DEATHS REPORTED.



A favorable sign is this: There has been a steady increase in the number of reported cases in this city for each year. At first the reporting was not taken seriously by the physicians. The reported cases only mean the new cases. The duplicates are not considered. This does not mean that tuberculosis has increased only the reports of the disease.

	CASES REPORTED	DEATHS
1900 (7½ mos.)	815	1407
1901	1149	1346
1902	944	1247
1903	1355	1227
1904	2138	1280
1905	2184	1224
1906	2131	1185
1907	2623	1138
1908	2646	1094
1909	2905	1065

Another very favorable sign is the diminution of unreported cases. The number of unreported deaths has steadily been growing less.

RELATION TO TOTAL CASES REPORTED EACH YEAR					
30% app.	In 1904	out of 1280	deaths 695	never reported
28.6 %	1905	1224	605	
18. %	1906	1185	406	
18. %	1907	1138	481	
16. %	1908	1094	400	
11. %	1909	1065	320	

This shows that the registration is becoming more complete more complete each year. In 1904 the unreported cases were more than 50% of the total deaths from that year and there has been a steady fall until in 1909 only about 30% of the deaths had never been previously reported.

The relation that the deaths from consumption in any one year bear to the cases reported in that year has greatly improved. That is to say, physicians are reporting cases earlier than was formerly done. A longer time elapses between the report and the death of the case. At first it seemed as if the cases were only reported as short a time before death as would make it possible to comply with the law. The improvement can be seen by the following figures:

	CASES REPORTED	DEATHS REPORTED		OF TOTAL REPORTED FOR YEAR
In 1905	2184	1043	or	47.7 died within 6 mos. after report
1906	2231	1006		45.1 " " " "
1907	2543	985		38.7 " " " "
1908	2645	945		35.8 " " " "
1909	2905	781		26. " " " "

Previous to 1905 the number of cases that died within six months after being reported was very much greater, being more than one-half the total cases reported in each year. There has been in this respect a great improvement, from more than 50% previous to 1905 the number has fallen to 26% in 1909.

The average duration of life of all the known cases after reporting has risen and is now something over two years.

These are some of the favorable results from registration. If, however, the registration alone is considered, health boards will find themselves greatly in error. Unless some of control is carried on a great many names will be carried on the registry having no practical value. A study of the reported (10324) cases for last four years has been made. Farther back than that it was not found necessary to go, as the registration previous to four years has very little worth, all the cases having practically disappeared. Probably similar results would be obtained elsewhere.

(1) About 41% of these recorded cases died and had come to the notice of the department by the death returns.

(2) About 5% were found by inspectors to have died. These would have been carried as still living if no control had been exercised. Many of these had died away from the city, at hospitals or elsewhere. Some had died in the city from some other cause than consumption; when the death certificate was looked up there was no mention of tuberculosis as a contributing cause.

(3) A large number running from 14% to 25% each year or 23½% of the total reported cases for the four years, could not be found at the place designated on the (reporting) card. This was shown by a visit made immediately after the notification. Many of the addresses were plainly fictitious, a vacant lot, a business block, or a number given that was not on the street. In many cases when the address was correct no such person as reported could be found living there.

(4) A few cases under observation moved away in the interval between the visits of the Inspector without leaving their address.

(5) A considerable number, 10% to 12%, went to hospitals or sanitariums. Beyond the fact that they had gone to a hospital or to take treatment somewhere, no further information could be obtained.

Thus, theoretically, while registration may appear simple, it is a complicated matter. From what I have shown some control is necessary and one of the most important is some sort of supervision or inspection.

In Boston all the cases have been kept as far as possible under observation by the Inspectors of our department, and all have been investigated up to the present.

In only eight, including Boston, of the thirty-four cities in this country, was any control exercised over the cases after reporting in 1909. In these there was either partial or complete supervision. In some private cases were not under any control. Two additional cities will begin this year to maintain complete supervision over all cases.

All the British cities have some form of inspection. One reply presents tersely the gist of the question (Edinburgh): "All cases visited except in the few instances on which the medical attendant reports all precautions taken. The cases are subsequently kept under gentle unobtrusive observation, so that any removal.may be followed by disinfection."

A health department must have its own means of inspection to carry out any method of control. The law requires notification to be made to health department, and it is the only body that has the means of knowing of all the reported cases.

In many cases the supervision can well be left with the attending physician, providing he will notify the Board of any change of address. There should be no control when the result can be accomplished in other ways.

To get a better registration there are certain lines of improvement.

(1) There is need for physicians to report their cases more carefully, 30% unreported cases is still large. An explanation is required from every physician who sends an unreported death from pulmonary tuberculosis. In the main we are dependent on our reports from: first, physicians; second, dispensaries and hospitals; from the bacteriological examination of the sputum; from charitable organizations, etc., and from death returns.

(2) There is more need of care in furnishing the correct address. A health board can do its part, but needs the co-operation of those afflicted with the disease. They must know their responsibility and the dangers others are exposed to by their not furnishing proper information. The function of a health department is primarily preventive, and only curative as prevention makes cure.

(3) With the increased number of patients admitted to hospitals and sanitoriums, it is necessary for a health department to know about these cases. Every hospital or sanitorium on the

reception of a case of pulmonary or laryngeal tuberculosis should be required by law to send the name and address to the city or town from which the patient came. They should also be required to notify the city or town on the death or discharge of the patient. This would overcome some of the difficulties of registration. Our Board has an order requiring owners and tenants to send notice when a case of tuberculosis moves. If this were more frequently complied with a great benefit would result.

It is impossible to give more than a rough estimate of the number of reportable cases in this city. There are so many that could not be found that there is a liability of considerable error. I have endeavored to find what has happened to all the known cases since 1906. If we assume that the same result has happened to the lost cases in each year as to those that have been traced there would probably be 4200 living cases on the registry. If these represent 70% of the cases as only 30% of the deaths last year had not been previously reported, this would give approximately 6000 reportable pulmonary and laryngeal cases in this city at present.

Some estimate the average life of a consumptive as three years, and find the number of cases by multiplying the deaths in each year by this average. I am inclined to think that our average of life would be somewhat higher. There is not, however, any definite relation yet established between the deaths and the number of cases. To find the actual number of deaths in any city it is necessary to find how many of the reported cases properly belonging to that place, die outside of the city. Further work may give more definite ideas on this subject.

There is an opportunity for smaller cities and towns to do excellent work in registration. With their smaller number and more fixed population, a better registration could be obtained and a very accurate estimate of the total cases in a town arrived at. Every case could be followed from time of registration to the end. The average duration of life of consumptives, the average length of life after reporting, the number that die in each year and some idea of what proportion recover, could be obtained. We would be able to know the curative results of the modern treatment of the disease.

DISCUSSION.

Dr. MINOT. While not very familiar with the subject, I think Dr. Brough has brought out very well many of the points and many of the difficulties that there must be; the actual difficulties of getting these reports. I think that the most important thing would be that which he recommends: a most careful account of the cases, a tracing of the cases from the time they are first known, to understand the situation; where they move to, the chances of infection, the duration of life—whether they get well or die, and how they get well or die. One thing which Dr. Brough alluded to, was the question of registration of deaths. That must vary in many places from what it actually should be, because oftentimes cases reported in Boston, for example, die outside of Boston, which would lead to a wrong impression of the number of cases. In the city of Boston now, a considerable number of cases under the hospital department, are transferred to the Holy Ghost Hospital in Cambridge, and the reports of these deaths appear in the reports of Cambridge and not in those of Boston. There were 124 such deaths in 1909. This leads to a more or less fictitious figure, of course, in regard to the deaths that should really be put down as Boston cases. The same would hold true in regard to cases dying at the State Hospitals for Consumption, or the hospital at Tewksbury or anywhere else outside of Boston. On the other hand some cases come to Boston and die which are not strictly Boston cases. I think Dr. Brough's paper is a very valuable one in showing the difficulty that doctors and boards of health must have in trying to follow and trace these cases. They should be given more credit, I think, than they sometimes receive.

Dr. CHASE, of Brookline. There are two questions I would like to ask of Dr. Brough. One in regard to crediting the deaths from consumption or other diseases where the patient dies away from home. Every year in Brookline we print in our report on vital statistics the number of deaths that occurred in the town and also the number of residents who died away from home, and form our estimate of mortality for the year on that basis. Is that the proper way, I would like to ask, to credit those deaths?

Dr. BROUGH. The only way we can do, of course, is to take the actual number of deaths in the city. In Boston there are many of the hospitals and institutions that receive cases from outside. I endeavored to get figures for the last four years and to look up the relation, but couldn't find out definitely. I should think there might be more deaths in institutions outside of the city that properly belong to Boston than possibly there are that come in, but still, a great many come in. I think that for some of the years I looked up there were as many as one hundred or one hundred and fifty died outside of the city that could not properly be credited to Boston. At the same time, Boston sends out a great many cases to other hospitals, of which we have no record, because the hospitals and institutions outside do not report to us when a case has died, so we have no way of crediting them. The only way we can find out about them is by our inspectors going to the houses. The reply would be that the case went to the hospital and died. We cannot always find out what hospital. Of course, where we can get information, the case is marked as having died. In that manner only could we find the actual death rate.

Dr. CHASE. You don't include the deaths of Boston residents which occurred away from Boston among the Boston deaths?

Dr. BROUGH. We couldn't find them; but that was balanced in Boston to a large extent because we have many hospitals and dispensaries to which people come from out of town.

Dr. CHASE. My other question was this: Dr. Brough stated that all cases of pulmonary and laryngeal phthisis should be reported. Since 1907 not only pulmonary and laryngeal tuberculosis but all forms of the disease are, by the public statutes, required to be reported. Dr. Brough hasn't told us what he thinks of that requirement. Is it wise or unwise to require all forms to be reported?

Dr. BROUGH. You mean, as a matter of practical value. If a case of tuberculosis of the skin is reported, I don't see how you can do anything, or regard it as an infectious disease. Of course, as a matter of registration, knowing how many of these

other forms of tuberculosis there are, it might be valuable, but not as a real practical Board of Health problem. I think the danger of infection is confined to pulmonary and laryngeal tuberculosis. It would be impossible in the other cases to look up and inquire about the isolation, and inquire as to their situation, without great complications. There are no objections to reporting them, but as a matter of practical value for Boards of Health, I suppose they must confine themselves to pulmonary tuberculosis. Probably most of the other forms come through pulmonary and laryngeal tuberculosis. We know that through those forms of the disease millions of tuberculosis organisms can be thrown off from throat and lungs. You know, in bone tuberculosis, the extreme difficulty of finding any organisms; you can work for a long time without finding a single organism. You can do the same in regard to lupus. You can make sections in the skin but it is extremely difficult oftentimes to find any organisms. So, as a preventive form of medicine, I do not think reporting them can be regarded as having any special value, I mean as far as any definite action is concerned, as cases to be looked up and looked after.

Mr. WILSON. I should like to ask Dr. Brough if he has any practical suggestions for securing the registration of cases when they go from the city to institutions and again on their return to the city from the institutions? There are many institutions outside the city which receive patients with tuberculosis, as those at Tewksbury or Bridgewater, or even the Hospitals for the Insane. At the present time patients are admitted to these hospitals and often dismissed to return home without any notification to the Board of Health which should have such patients under supervision. Has the speaker any plan for curing that situation?

Dr. BROUGH. I mentioned that I thought there ought to be some law or regulation passed requiring these institutions or sanitoriums either private or public that receive these cases, to notify Boards of Health of a city or town that a case has been received from that city or town, and the address, and when the case is discharged they should also send a notice to the

city or town to which the case is going, stating the probable address of the case, and in the same way, when a patient dies, a notice should be sent to the city or town from which the case has been received. In that way you would have a more accurate registration than we have at present. I suggested that in the paper.

Dr. SWARTS, of Rhode Island. I would like to state the practice in Rhode Island. The law requires that the institution shall report. In fact, the amount of the fine imposed upon the superintendent of the institution failing to report is ten times greater than that upon a physician who does not report. Before the state law was passed the practice was already in vogue that the sanitorium would report to the Board of Health, to Dr. Chapin, in his city, and now to the State Board of Health, for the whole State, stating where the patients had gone to. But as you may know, it is very little advantage, so far as Dr. Wilson's suggestion is concerned, that fumigation might be brought about, for fumigation down our way doesn't stand in very high favor. It is of value to us to know where the patient goes to. We can advise the local League or District Nurse's Association, and they in turn can follow up the case and keep up the habits which the patient has learned in the sanatorium and which we know are likely to lapse unless the nurse keeps up the stimulation.

Dr. PAQUIN, of Webster. I would say that the plan of notification to the local Board of Health is carried on by the Rutland Sanitorium. The Superintendent or Examiners notify local Boards of Health of every patient examined for admittance who shows signs of tuberculosis and also notify the local Boards of Health after a patient has taken a course of treatment at the sanitorium and is discharged, particularly if the patient has not made a good recovery and needs supervision. But I cannot say as to whether or not local Boards of Health from where the patient originally belonged, are notified after a patient has died at the sanitorium.

OPHTHALMIA NEONATORUM: FACTS CONCERNING THE DISEASE AND ITS PREVENTION AS AFFECTING THE STATE OF MASSACHUSETTS.

By MARK W. RICHARDSON, M. D.,
Secretary of the State Board of Health.

Ophthalmia neonatorum and its important relation to health, happiness and efficiency has always been a subject of supreme human interest.

Due, in a great majority of cases, to a micro-organism which is responsible for one of the greatest venereal scourges of mankind, its history is necessarily coterminous with that of gonorrhoea in general. As with other bacterial diseases, however, great advances could not be made in the study of the prevention and cure of this malady until its causation was definitely determined. The role of gonococcus as the major cause of gonorrhoea was made plain by Neisser in 1879, and in 1881 Credé showed that the systematic use of solutions of nitrate of silver in the eyes of new-born babes would eliminate almost absolutely the occurrence of ophthalmia neonatorum. Important as was this latter discovery, however, the fixing of the responsibility for gonorrhoeal disease upon a definite micro-organism, the gonococcus, stimulated and furthered the study of the conditions in a way possible through the occurrence of no other event. Given the chief cause of the disease, the manner of its spread and a reliable method of prevention, it would seem that the disease, at least as far as the eyes are concerned, has no excuse for existence. This happy result is, I am sorry to say, far from actual achievement, and it is to discuss the reasons for the continuance of ophthalmia neonatorum and its baleful consequences that this paper has been written.

As stated above, Credé discovered the efficiency of nitrate of silver as a prophylactic in 1881, and this important fact has been incorporated into the teaching of text-books and professors ever since. Laws have been passed requiring physicians to report to

local boards of health the occurrence of inflammation in the eyes of the new-born, the law of Massachusetts having been passed in 1905. Medical journals publish masterly articles on the subject and exact information has been sent to each physician of the Commonwealth by the State Board of Health, and yet, up to the present time but little check seems to have been exerted upon the occurrence of the disease.

What do statistics tell us?

According to the official census there were, in New York State, in 1906, 6,200 blind persons. Of this blindness, 32 per cent was due to preventable causes, and 10 per cent. or 620 cases, was due to ophthalmia neonatorum.

Another investigation showed that of the new admissions to ten schools for the blind, 25 per cent was blind because of ophthalmia neonatorum.

According to figures submitted by the Massachusetts Commission for the Blind, there are in Massachusetts about 400 blind persons, of whom 25 per cent became blind before they were four weeks old.

At the Boston Nursery for Blind Babies, in 31 out of 51 cases the blindness was due to ophthalmia neonatorum.

Through the kindness of Miss Kate Brannick of the Social Service Department of the Massachusetts Eye and Ear Infirmary, I am able to quote details concerning 116 cases of ophthalmia neonatorum, this being the full number of cases treated in the Gardiner ward of that institution during the period from October, 1908, to October, 1909.

"The following tables give the more significant statistics:

PLACE OF BIRTH:	
At home	106
In hospital	10
BIRTH ATTENDED:	
By private physician	95
By dispensary physician	16
By city physician	3
By midwife (non-professional, physician later)	2

SENT TO INFIRMARY:	
By attending physician	72
By specialist or other physician consulted later on	11
By lying-in hospitals	2
By board of health	5
By other social or charitable institutions	8
By midwife (not attending)	1
By other advice	8
SENT TO INFIRMARY:	
From Boston	71
From 27 other Mass. cities and towns	42
FROM other States	3
VISION ON DISCHARGE:	
Normal	87
1 eye disabled	6
1 eye blind	16
Blind	6
Question of total blindness	1

Following is the history of the six children made totally blind:

1. Second child of colored parents; born in city adjacent to Boston. The father deserted a few weeks before the child's birth and the mother was compelled to call upon the city physician for confinement. He prescribed for the eyes on three separate visits, but did not advise hospital care. A friend of the mother took the child, when two weeks old, to a member of the Overseers of the Poor, likewise a physician, who sent at once to the Infirmary, but too late. This child died later at the Nursery for Blind Babies.

2. Child of American-French parentage; born in large manufacturing city of New Hampshire. Birth attended by private physician, who gave no treatment for the eyes, but sent to the Infirmary when one week old, too late to save the vision. Living in New Hampshire.

3. Second child of American parents. Comfortable home in same city as Case 1. Birth attended by private physician, who gave treatment for the eyes and suggested the Infirmary, but did not advise. Taken to Infirmary when five weeks old by the mother, who refused to leave it in the hospital until reminded that the matter would have to be referred to the Board of Health. Ulcer, both eyes, when admitted. Died later at home.

4. Third child of Jewish parents in comfortable circumstances in Massachusetts mill town. Birth attended by private physician and untrained nurse. Doctor prescribed medicines for the eyes, which were administered by the nurse. Taken to the Infirmary on this doctor's advice, when 11 days old, too late to save the eyes. Living in Massachusetts.

5. Illegitimate child of Irish-American parentage; born in a Massachusetts city. Birth attended by private physician. Mother gave history of gonorrhoeal discharge, for which the doctor prescribed. Case of so-called secondary infection, when child was about 16 days old, and attending physician was again called. He prescribed and instructed the mother to send for him again if the eye condition did not clear; but told her nothing of the possible serious nature of the trouble. Called in again when child was two months old, when he sent it at once to the city physician, who in turn sent to the Infirmary. Blind when admitted. Living in Blind Babies' Nursery.

6. First child of Lithuanian parents; born in adjacent city; father earning $15 per week; good home. Birth attended by private physician. Mother gave history of gonorrhoeal discharge. Case of secondary infection when child was about ten days old and visits of the doctor had ceased. Taken to the Infirmary by the parents when sixteen days old, too late to save the eyes. Living at home.

The statistics of the nationality of these babies do not bear out the general belief that the disease occurs largely among the non-English-speaking people. Of the 116 babies, 73 were of English-speaking parentage, practically equally divided among American, Irish and British (Provinces). Of the remainder, ten were of French-Canadian parentage, 10 Jewish, 6 Italian, 2 Swedish, 1 each German, Portuguese, Polish, Lithuanian, Greek; 10 were colored.

Nor do the figures confirm the general impression that the disease is found in the homes of the very poorest; 63 of the homes from which these babies came may be described as good; 19 more, as fair.

One of the most significant facts brought out in the study is the very few instances of babies sent to the Infirmary from the various lying-in hospitals, where the cause of infection must so

frequently exist. This can be accounted for only by the use of prophylactics, which has now become general in the lying-in hospitals. If such prophylaxis should become general throughout the State, the resulting familiarity with its use would tend to eliminate the chief objection raised against it; namely, that it may be used not wisely but too well, as it has been put by one critic."

In 1905, the following law was passed by the Massachusetts Legislature:

(Revised Laws, Chapter 75.)

SECTION 49. A householder who knows that a person in his family or house is sick of smallpox, diphtheria, scarlet fever or any other infectious or contagious disease declared by the state board of health to be dangerous to the public health shall forthwith give notice thereof to the board of health of the city or town in which he dwells. Upon the death, recovery or removal of such person, the householder shall disinfect to the satisfaction of the board such rooms of his house and articles therein as, in the opinion of the board, have been exposed to infection or contagion. Should one or both eyes of an infant become inflamed, swollen and red, and show an unnatural discharge at any time within two weeks after its birth, it shall be the duty of the nurse, relative or other attendant having charge of such infant to report in writing within six hours thereafter, to the board of health of a city or town in which the parents of the infant reside, the fact that such inflammation, swelling and redness of the eyes and unnatural discharge exist. On receipt of such report, or of notice of the same symptoms given by a physician as provided by the following section, the board of health shall take such immediate action as it may deem necessary in order that blindness may be prevented. Whoever violates the provisions of this section shall be punished by a fine of not more than one hundred dollars.

SECTION 50. If a physician knows that a person whom he is called to visit is infected with smallpox, diphtheria, scarlet fever or any other disease declared by the state board of health to be dangerous to the public health, or if one or both eyes of an infant whom or whose mother he is called to visit become inflamed, swollen and red, and show an unnatural discharge within two weeks after the birth of such infant, he shall immediately give notice thereof in writing over his own signature to the selectmen or board of health of the town; and if he refuses or neglects to give such notice, he shall forfeit not less than fifty nor more than two hundred dollars for each offence.

Moreover, in May, 1909, ophthalmia neonatorum was made reportable to the State Board of Health in accordance with Sections 49 and 50 of Chapter 75 of the Revised Laws. The

effect of these official actions can be studied best, perhaps, in a table kindly furnished by Dr. S. H. Durgin, Chairman of the Boston Board of Health.

REPORTED CASES OF OPHTHALMIA NEONATORUM IN BOSTON.

YEAR	CASES REPORTED	TREATED IN HOSPITAL	BROUGHT FROM OTHER CITIES
1905 (from Sept. 5)....	16	3	..
1906	34	13	1
1907	17	7	..
1908	39	31	2
1909	171	115	30

All cases of ophthalmia neonatorum reported and not already under treatment in hospital are seen by a medical inspector, and if proper care cannot be secured in the home the case is sent to the hospital.

It will be seen that the percentage of reported cases which go to the hospital has laregly increased, as has also the number which come from outside the city.

The records of the State Board of Health show no cases reported in 1905, 1906 or 1907; 20 cases in 1908 and 100 cases in 1909. There can be no doubt that the large increase in reported cases in 1909 was due to the action of the State Board of Health in putting the disease on the notifiable list, in sending to each practitioner a communication calling his attention to the law and in giving him detailed information concerning treatment. It is, of course, too early to estimate the effect upon the aggregate blindness of the State.

The best statistics agree that at large maternity hospitals, the routine use of antiseptics prevents in large measure ophthalmia neonatorum. In a series of 2265 births before the use or prophylactis 10% developed ophthalmia. In 1160 births with prophylactics 0.17% had ophthalmia. This being the case, why does not the attending physician in private practicc, following the advice of Credé, instill into the eyes of new-born infants a solution of nitrate of silver of proper strength? It is, in part, undoubtedly, because it is one more thing to attend to at what is apt to be a very busy time. More, important, undoubtedly,

is the fact that the disease is, after all, so rare in the private practice even of eye specialists that the possibility of its occurrence is not considered by the physician until it falls suddenly to his lot. Long immunity leads him to minimize the danger. Then, too, he may fear that if the real reason for the instillation be known, uncomfortable doubts and suspicions may be raised in the mind of either of the parents or of both. Having the case of ophthalmia neonatorum in one of his patients, why does not the physician report the case promptly to the local board of health as required by law? Here again the physician is apt to minimize the importance of the condition and to believe the situation is one simply of slight irritation and that it will clear up speedily. Too late does he lealize the condition and then irremediable damage has been done. Here again it is very probable that the physician is deterred from reporting a case of ophthalmia neonatorum because of the possible unpleasant notoriety which might fall upon the parents. He fears the spreading broadcast of the information that a certain baby is suffering from a disease having in all probability a well known venereal origin.

That such a fear is not entirely ill-founded is shown by certain tendencies in modern newspaper practice. In a certain city of this State, it is the custom to publish, periodically, notices of the decease of the city's inhabitants, together with the causes of death. I am credibly informed that this practice has produced in the custom of the physicians a distinct change, so that causes of death which might bring unpleasant notoriety upon the family of the dead person are incompletely or even falsely reported.

If such sensational newspapers should carry this practice still further and report in the public prints the causes of disease in those who are unfortunate enough to be sick, it is easy to see that physicians might cease to report even the small number of cases of ophthalmia neonatorum which now reach the health offices.

There can be no other opinion, I think, than that this newspaper practice is most reprehensible. It is done, of course, to cater to the morbid curiosity of the masses. It cannot fail to have a very marked deleterious effect upon the value of our vital statistics, to say nothing of the shame and grief which it must from time to time bring upon the innocent relatives of the dead.

Why have not more physicians been brought into court and prosecuted under the law requiring notification? As far as I can learn the main reason for lack of prosecutions has lain in the difficulty of securing the co-operation of those individuals most conversant with the facts. As before stated, parents, physicians, and hospital authorities also display the greatest hesitancy in publishing to the world the details of cases of ophthalmia neonatorum.

It has been suggested that a civil suit for damages instituted by the parents of a child who had lost its eyesight through ophthalmia neonatorum might be the most efficient method of awakening the medical profession to its responsibilities. Such a plan would seem certainly to have some merit.

In an effort to counteract this evil some States—Indiana, Minnesota, New York and Ohio—have placed upon their birth certificates, questions as to whether a prophylactic has been used at the birth. I have not been able to learn whether this change in the birth certificates has brought about any amelioration in conditions. Two States, furthermore, (New York and Rhode Island), have undertaken to furnish to practicing physicians prophylactic outfits in the shape of small vials of nitrate of silver solution (1 per cent), together with appropriate droppers. Here, too, I cannot learn as to the ultimate effects of this procedure. The State Board of Health of Massachusetts has this latter question under consideration. With free distribution to physicians of prophylactus there would certainly be no excuse for failure to use them.

In a discussion of ophthalmia neonatorum, the relative responsibility of midwives for the occurrence of the disease is distinctly pertinent. I cannot find, however, that midwives are more at fault than the regular practitioner. The midwife has no legal status. She practises a branch of medicine without a license, yet, curiously enough, through an oversight in codifying the laws, she is officially recognized on the birth certificate in use in this Commonwealth. There can be no doubt that she should either be brought under proper supervision or she should be suppressed. In Fall River, in 1908, according to a preliminary report by the research department of the School for Social Workers, 829 births were reported by midwives and 2,297 by physicians.

CONCLUSIONS.

1. The cause of ophthalmia neonatorum and the manner of its spread are known.

2. Reliable methods of preventing the disease are known.

3. The law in Massachusetts is such that the disease, if promptly reported, may still be deprived of many of its destructive effects through energetic co-operation of local and state health authorities.

4. Improvement in conditions is, undoubtedly, going on, but it is slow. Rapid change for the better can be obtained only through a sharp appeal to the self-interest of the practitioner. There can be little doubt that vigorous enforcement of the law concerning notification, with or without resulting convictions, would, through the publicity alone, impress the importance of this matter upon the profession to an extent possible in no other way.

5. The practice of midwives in Massachusetts is extensive and without supervision. They should be regulated or suppressed.

DISCUSSION.

Dr. SWARTS, of Rhode Island. It is hardly necessary to appeal to practical health officers here as to the pathetic side of this question—as to whether an infant, being brought into the world without its own volition, shall be subjected to blindness, whether it will or no. The question before us is whether or not we have here a communicable disease, a preventable communicable disease. Assuming we have, in view of the paper we have heard and the general literature published, the question is why we should not undertake some means of prevention. As has been stated in the paper, the question is why the physicians do not report their cases. In the first place, I think if they had the cases they would not care to report them, from fear of censure on the part of the family. Second, in many instances, the cases occur after the physician has been dismissed from the case. As I understand the general practice of the accoucheur, it is to attend cases and give three free visits for the fee imposed upon the family—excuse the word "impose." That being the case, the physician not being there, perhaps, for more than three or four days after the birth of the child, he is not aware of the fact that the disease has occurred. I have run across cases in Rhode Island where the disease has occurred from the ignorance of the parents, because the physician has not warned them to be on the watch for symptoms of the trouble.

Then the question arises, is there any advantage in prophylaxis? As has been suggested by the writer, by the use of the Credé method, preferably one rather than two per cent of the nitrate of silver solution, as causing less inflammatory conjunctivitis, one may be able to prevent the disease. It is, however, a difficult matter to get the general practitioner to use anything in the baby's eyes at each birth. If anything happens, and he was discovered putting drops in, why, he was the cause of the trouble. But the experience of practitioners who have practised in lying-in hospitals, where they use a preventive, and where they have the worst kind of cases, is that very few cases develop when the children are born there. If that is the case, it is practicable, probably, to prevent the disease; or we should look for it in those institutions. But in general practice I have

learned from physicians who have had experience that way, that they were able to put these drops into the eyes of the baby on the ground of cleansing the eyes without explaining that they are nitrate of silver. And that brings in the point—we cannot use what we would like to—the other two silver solutions, argyrol and protargol, for the reason that they produce a mahogany stain. After putting a few drops of that mahogany colored stain into the eye, there wouldn't be any question on the part of the family that the doctor produced the disease. He isn't going to get into trouble that way. But it seems possible we can educate the physician to a sense of his duty in using nitrate of silver; and surely, in any case, we can educate him to a sense of his duty to warn the parents as to what is likely to occur, especially if there is any liability to the disease. And especially it seems to me it is the duty of Boards of Health to educate the people that this disease exists, and is liable to occur, and to be on the alert for it. Of course, there are different ways of educating the people. Some believe in telling the people, and some believe in hoping that they will hear of it in some way. That is a practical question for the Sex Hygiene Committee to work out. And of course, one question involves the other.

We have in Rhode Island endeavored to educate the physicians to a realization that there is such a thing as a prophylactic and such a thing as a disease called ophthalmia neonatorum by distributing among them outfits containing nitrate of silver and circulars of information on the subject. They also carry with them a little suggestion to the doctor that nitrate of silver alone first dropped in is not sufficient but he must go on with his treatment, following up the case, if he proposes to save the eyes. It isn't a question of today, but of tomorrow. Where we sent out our outfits at the first of the year last year, we are sending them out at the beginning of this year. We place them in the stations where diphtheria and other outfits can be obtained, and there can be no excuse that the physician has got to go seven miles before he can get hold of the solution; it is in his bag along with his other paraphernalia for the proper treatment of the case, and he can keep stocked up without expense. It seems to me a favorable thing for the Boards of Health to educate the physicians in this way and to assist them in having prophylactics

handy. We sent out last year one thousand of these cases and intend to this year. From Dr. Porter, of the New York State Board of Health I understand that they have sent out twenty-five thousand in that state. The number of cases reported was only twenty-four cases in 1908, and forty cases in 1909.

As to finding out practical results, I doubt if we shall ever see the actual results of this treatment, because we don't know in how many cases the disease occurred after the use of it, or in how many cases the doctor did not use it, and the disease did occur. But if the labor and expense serve to save one pair of eyes only in each State it will be a good investment.

Dr. PALMER, of Framingham. There is one practical feature that appeals to me. I think it is true that physicians as a rule, know enough, if they would do what they know, to take these precautions. The midwife, the average midwife, I think it is safe to say does not know enough to take these precautionary measures. Now, it seems to me this Association could do a thing of practical value here today if they would request the present legislature through its Committee on Public Health to take some action for an oversight of the midwives of Massachusetts. To bring it before the Association, I move you to that effect. (Motion adopted.)

(Adjourned.)

PERSONAL HYGIENE.

By PERCY G. STILES, Ph. D.
Assistant Professor of Physiology in Simmons College.

PHYSIOLOGY AND RATIONAL HYGIENE. Popular ignorance of the working of the human body is impressively extensive. Misconceptions of its physiology abound. Sometimes these are encountered in the form of vague statements which the user cannot elucidate but which nevertheless appear to satisfy him. Hence the free reference to "humors" and "bad blood." Sometimes more definite notions come to the front, as in the prevailing tendency to hold the liver responsible for every sort of minor ill. "Torpid liver" is a favorite euphemism for constipation. The evils of autointoxication are constantly charged upon the organ which is our chief defense against the mischief in question. And as to the bile, who has not heard people allude to this secretion as to a poison which ought not to be formed in the body? The convalescent from sea-sickness will almost always say, with a reminiscent shudder: "I think it must have done me good; I got rid of a good deal of bile." In the field of physiological mechanics we meet the curious notion that the lungs make the chest enlarge instead of the chest the lungs.

Some of these odd views may be held without practical detriment as may the opinion that the earth is flat. But in other instances erroneous conceptions of the body may have serious results. For a fantastic physiology may lead to a fantastic hygiene. The man whose ideas of his physical system are unsound is the man who may be led widely astray by the strange doctrines of self-constituted teachers of health cults. He may readily fall a victim to quacks when he is sick. An elementary knowledge of physiology is a valuable asset to the voyager whose course is to be held steadily between the Scylla of patent medicines and the Charybdis of Christian Science.

We have come to a time when the medical profession needs defenders. Much is written and spoken against its supposed conservatism of spirit and inadequacy of method. Its detractors charge upon it errors and excesses that were long ago abandoned.

Surgeons are carelessly charged with performing needless operations for mercenary ends. Many people point to the diminishing use of drugs and recklessly conclude that all medicines are without value. The uncritical observer of the cures wrought in Christian Science circles and in classes in psychotherapy fails to appreciate that many forms of disorder lie outside the sphere of such ministrations. This is in spite of earnest efforts on the part of leading workers in the field of mental healing to disclaim anything like a universal range of service among the sick. Certain periodicals—"Life" being conspicuous among them—having begun with an agitation against experiments on animals, have gradually come to ridicule the medical profession and belittle its services.

It is not necessary to know a great deal of physiology to be safeguarded against such errors of judgment. But how few people of average intelligence have a stock of information upon this subject at all comparable with their knowledge of geography! The map of Africa presents to them a more familiar outline than does the diagram of the human stomach. This ignorance has several causes. An important one is the unfortunate treatment of the subject in the public schools. Physiology, or rather anatomy, is taught to young children who cannot visualize the structures which they painfully memorize and who cannot comprehend their workings. The subject rarely has a place in High School programs where it might be useful. A science which could not be evolved historically until chemistry and physics had provided a foundation for it is forced upon pupils several years in advance of these fundamental studies. It is not strange that adults of the present generation recall physiology, if at all, as a vaguely unpleasant memory of grewsome charts and many-syllabled names. About the impression there will probably linger an alcoholic aroma.

The teaching of physiology in grammar schools must always be unsatisfactory and should perhaps be largely replaced by instruction in hygiene. In high schools physiology ought to have an important place. But for some time to come it will be difficult to have it well taught. There are few branches in which it is more essential that the teacher shall have a large reserve of detailed knowledge. Without much reading of the best books

and a broad training in chemistry, including that of organic compounds, no teacher can safely undertake to answer the questions of an eighteen-year-old class. If he indulges in speculations he will almost certainly become responsible for serious misconceptions.

In all instruction in physiology given to pupils of any maturity, the emphasis should be mechanistic. Much false hygiene springs from the failure to recognize the sway of the laws of chemistry and physics over the animal body. To deny the operation of such laws is to open the way for the dangerous view that right use and care of one's self are not supremely important. An organism exempt from the limitations of all mechanisms might escape the obligations of hygienic living and the penalties of its violation. In the opinion of the writer the greatest achievement of nineteenth century physiology was the demonstration that the principle of the conservation of energy applies rigidly to living things.

The mechanistic approach does not lead to the neglect of mental factors in hygiene though this might be predicted by some critics. If we regard the nervous system as a mechanism it remains as true as ever that the processes in it which accompany optimistic thinking go far toward securing the right working of the various organs. The significance of habit is the more clear when its physical basis is understood.

There would be less reason for this plea in favor of more general intelligence in regard to the human body if there were not so much written about health in the magazines and elsewhere. Much of the dogmatic hygiene thrust upon the general reader is wholesome and helpful. Some of it is quite otherwise. The advice given is very questionable when there is an advertising motive—the introduction of a new breakfast-food, a beverage, or a tonic. Even in the hygiene columns which are genuine editorial productions there is likely to be a great deal of individual experience which is rashly assumed to apply to all men. A moderate familiarity with physiological principles makes it possible for one to read such paragraphs with discrimination, saying of one suggestion, "That is reasonable," of another, "That would not apply to everyone," and of a third, "That can hardly be sound."

VETERINARY HYGIENE.

By W. L. BEEBE, D. V. M.,
Bacteriologist for the Minnesota Live Stock Sanitary Board.

JOHNE'S DISEASE. The subject of Johne's Disease has in the past few years received much attention in veterinary journals and also received much at the International Veterinary Congress at the Hague last year. There is a very marked difference of opinion as to the origin of the bacterial cause. Some are of the opinion that it is a variation of the tubercle bacillus of Koch, while others think that it is the avian tubercle bacillus and some think that it is a saprophytic form of the bovine tubercle bacillus. A very forcible argument against the theory of the attenuated bovine bacillus is that in Jersey where tuberculosis is unknown, this disease is widespread.

From the sanitarian standpoint this question is of very little importance as in all probability it would not be of material aid in controlling the disease. The most important thing to be borne in mind is that the bacilli are contained in the feces and that to eradicate the disease from the herd all cases should be disposed of as soon as possible. An animal will many times make a partial recovery and later have a recurrence of the disease and die. It is very probable that in these cases the bacilli were present in the intestinal mucosa and were being discharged in the feces constantly.

It should be the duty of the veterinary officials to locate all infected herds and adopt means to prevent of the disposal of infected animals for breeding purposes. The chronic nature of the disease makes it particularly hard to deal with and for this reason it would be wise to give more attention to the disease or in certain locations it may become as prevalent as bovine tuberculosis.

BOVINE TUBERCULOSIS, CONTROL. Several States have adopted the method of paying a reimbursement for condemned tuberculous animals. This work has been going on in a few instances for a long enough length of time to reap results,

particularly where several hundred thousand dollars have been paid out. Dr. Reynolds at the International Congress last year pointed out that it would require $35,000,000 to eradicate tuberculosis in Minnesota, if the present methods were followed. At this rate what would it cost to stamp out the disease in the United States? This is by far the most wide spread disease and the most disastrous to the cattle raising industry that we have to deal with. It should therefore receive more careful consideration. When a large indemnity is paid to the farmer and he proceeds to replenish his herd with untested cattle or neglects to make second test for several years it would appear that the states are being defrauded? Yet such is the case and how can it be avoided? When the pioneers were starting out with this work, it was necessary for them to pay the farmers an indemnity in order to get them to have their cattle tested. Now the prevalence of this disease has been pointed out and if an indemnity is to be paid the farmer should be made to replace the condemned animals with cattle that have passed the tuberculin test. In Jan., 1910, a law went into effect in Minnesota requiring that all pure bred cattle should pass the tuberculin test before being sold. This is a very important step forward for records show that a large percentage of tuberculosis in the grade stock comes from pure bred cattle. In Wisconsin a law recently went into effect requiring all cattle that were sold, either pure breds or grades, should be tested with tuberculin. In Minnesota, testing by laymen is now allowed as is the case in Wisconsin, so it would be impossible to enforce such a law as in certain sections of the states there are no veterinarians and the price to get a qualified man would make it prohibitive.

The control of this disease is in the hands of very able men in most instances, and they are to be commended for their work, but are the farmers doing their share in preventing the spread of this disease?

It has been shown that the pasteurization of skim milk prevents almost wholly the spread of tuberculosis among calves. If this method was adopted and the reacting animals isolated and their products pasteurized it would be of less expense to the state and also to the farmer. This would not be applicable in all cases

as people object to drinking pasteurized milk. Also, it is worthless unless the farmer takes interest enough in the matter to see that his milk is properly pasteurized and that his isolation is complete. This method has proven satisfactory in several European countries and why not try it more in this country?

MUNICIPAL SANITATION.

By CHARLES V. CHAPIN, M. D.,
Superintendent of Health, Providence, R. I.

FLIES AND DISEASE. The last report of the Commission on Typhoid Fever in the District of Columbia (Hygienic Laboratory Bulletin, 52, p. 30) briefly discusses the relation of flies to typhoid fever. A chart is presented showing the seasonal distribution of flies and typhoid fever cases in Washington during the summer of 1908. According to this diagram the maximum number of flies were found towards the last of June and after that time they decreased quite rapidly. The maximum number of typhoid fever cases occurred about a month later, and during the next two months decreased only slightly. The Commission concludes that "The parallelism between the two curves certainly is not sufficiently striking to warrant the conclusion that flies play much of a role in the transmission of typhoid fever in Washington." They suggest, however, that the flies may be somewhat of a factor in the spread of the disease, and perhaps at times may be of importance in small local outbreaks.

During the years 1907 and 1908, in London, (Reports of the Medical Officer of Health to the London County Council), Hamer made a series of very valuable observations in regard to the distribution of flies. This work is worthy of the careful perusal by all who are interested in this subject, and the accuracy with which it is done, and the caution shown in drawing conclusions from it stand out in sharp contrast to most of the fly literature published by American health officials. Hamer studies the distribution of different species of flies in point of time, and also their local distribution. Quite a number of centres, such as stables, dumping grounds, and places where offensive trades are carried on, were selected, and the distribution of flies around these was carefully noted. It was shown that there was a marked difference in the number of flies near such places and a few hundred yards distant. Last summer similar, though less extended observations were made on the local distribution of flies in Providence. Surprising differences were noted in regard to the number of flies found in the clean and filthy sections of

the city. Where yards were untidy and in the vicinity of cheap markets, and around dirty tenements flies were several hundred times as numerous as in the best residential sections. In London, Hamer gave careful attention to the relation of flies to summer diarrhea. Although there was some correspondence between the fly curve and the diarrhea curve, it was not in either year close enough to indicate any causative relation between the two. As Hamer well says, even if the two curves should correspond exactly, it would not, as so many seem to assume, demonstrate the dependence of diarrhea upon flies. There was some evidence that diarrhea was no more prevalent around stables than elsewhere, though flies were vastly more numerous. In 1908 there were many less flies than in 1907, but very much more diarrhea. In 1907, during the continuance of excessive fly prevalence, diarrhea was steadily increasing, while during a similar period of fly excess in 1908, diarrhea was decreasing. Hamer thinks that both flies and diarrhea are more likely to be dependent upon some cause or group of causes, than that diarrhea is dependent upon flies.

ISOLATION IN HOSPITALS. In the last number of the Journal a reference was made to the success attained by Dr. Gordon at Manchester in the treatment of other diseases in open scarlet fever wards, by insisting upon strict medical asepsis, and for moral effect inclosing the patient in a barrier of wet screens. Dr. Miles B. Arnold, Gordon's successor, writes me that he has now abandoned the screen of damp sheets, because with them it is impossible to see the patient and to oversee the nurse. It is also depressing to the patient to be thus surrounded, and the evaporation from the damp sheet is not desirable. Dr. Arnold fences off the case with a tape, which is just as effectual a barrier to the imaginary flight of germs as are wet sheets or solid walls.

REGISTRATION OF CASES OF DIARRHEA. During the summer months of the years 1905–1908 the notification of diarrhea was compulsory in Woolwich, London. During this period 844 cases were notified, of which 115 died, which gives a case fatality of 13.5 percent. This is almost precisely the fatality noted in Huddersfield. (Report of the Medical Officer of Health of the County to the London County Council, 1908, p. 45.)

TYPHOID FEVER FROM A SWIMMING TANK. Reece (Report of the Medical Officer of the Local Government Board, [Eng.] 1908–9, p. 90.) reports an outbreak of typhoid fever occurring among naval recruits stationed at Walmer. There were in all 33 cases, and according to Reece there hardly seemed to be any chance for contact infection, at least among the earlier group. Water, milk and other foods seem to have been certainly excluded. It was found that all the earlier cases frequently made use of the swimming tank, which was shown to be polluted with typhoid infected sewage. Reece believed that the outbreak had its origin in this infected tank, though perhaps was continued to some extent by contact infection.

TUBERCLE BACILLI IN MILK. Delepine, at Manchester, England, has for many years made a careful study of the infection of the milk supply of that city with tubercle bacilli. A very full account of his work is given in a special report included in the report of the Medical Officer of the Local Government Board, 1908–1909, p. 341. From a careful examination of the herds from which tuberculous milk was derived, Delepine concludes that the bacilli almost certainly come from diseased udders in about 78 percent of the samples, and probably from that source in about 16 percent. He believes that by means of bacteriological examination of the milk, and inspection of the udders, but by neither procedure alone, the danger of milk becoming infected with tubercle bacilli can be very largely eliminated.

COLD STORAGE OF VACCINE VIRUS. Blaxall and Fremlin, (Report of Medical Officer Local Government Board, 1908–9, p. 455), have made a series of experiments in regard to the preservation of vaccine lymph in cold storage. They find that it can be kept below a freezing temperature for two years with practically no deterioration. Of 8,559 persons vaccinated with such lymph, 97.8 percent presented evidence of successful vaccination.

SANITARY ENGINEERING NOTES.

By ROBERT SPURR WESTON,
Assoc. M. Am. Soc. C. E.

PURIFICATION OF DRINKING WATER FROM MANGANESE BY ALUMINUM-SILICATE, H. Noll, Gesundbreitsingen. 31, 533–9. An account of experiments on a small scale for the removal of Mn from water by passage through a layer of aluminum silicate where the Al of the silicate displaces the Mn which then combines with the silicate and can afterward be removed by washing with strong KCl solution, regenerating the silicate for further use. The author concludes that the best commercial silicate obtainable, "Permutit," while removing the Mn satisfactorily increases the hardness through solution of lime by CO_2 in the water. Cheaper grades contain $CaCO_3$ which also adds to the hardness. The action varies so that experiments are necessary to determine its adaptability and method of use for each water. When the Mn is present as carbonate it gradually oxidizes and cannot then be removed. This trouble is obviated by excluding air during treatment. The cost of the chemical is about $15.50 per million gals. treated.

INTERPRETATION OF CHEMICAL WATER ANALYSIS, H. Klut (Trans. E. A. Gieseler) Eng. Rec. 60, 498–500. A review of the subject giving the significance of each of the different constituents determined, for sanitary and for industrial use.

SANITARY CONTROL OF FILTER PLANTS, F. D. West, Proc. Eng. Club of Phil. 26, 135–47. This paper gives a brief description of the operation of sand filters and a few important features of their construction with tables showing their efficiency in purifying the water supply of Philadelphia. The Torresdale Filter Plant began to deliver filtered water to the Frankford district, which had previously been using unfiltered Delaware water and had the highest typhoid rate in the city, in July, 1907. A marked improvement appeared at once. The

output was increased until Feb., 1909, when the whole city was receiving filtered water. The typhoid death rate was 25 per 100,000 in 1909, against 72.6 in 1906, 59.7 in 1907, and 35.0 in 1908. These filters keep the bacterial count below 100 per cc. and algae are reduced 99%. B. coli are seldom present and the water is clear. These filters also, by making possible the use of the softer Delaware River water instead of Schuykill water should save $280,000 per annum in cost of soap alone and should decrease boiler incrustation one-half.

WATER SOFTENING OR PURIFICATION AND ITS SAVING, M. Miller, Chem. Eng. 10, 117–21, (Oct., '09). A brief resumé of methods for boiler water softening with a discussion of the cost and saving involved. The best results are obtained from softening plants and particularly from the automatic machine type. The installation of such a plant costs from $5.00 per H. P. for plants of less than 1000 H. P., to $1.20 per H. P. for those of 15,000 H. P. The depreciation is less than 5%. The cost of chemicals varies with the water. Those whose hardness is due only to carbonates of lime and magnesia are least expensive as they require only lime water, costing 0.2c per 1000 gals. to remove 10 gr. per gal. of the former constituent, and 0.48c per 1000 gals. to remove the same amount of the latter. Sulphates and other soluble compounds of lime and magnesia require soda ash. 10 grs. per gal. of $CaSO_4$ costs for removal 1.20c per 1000 gals. and $MgSO_4$ costs 1.36c per 1000 gal. The expense of attendance is very small as the work seldom takes more than a part of an untrained man's time. The fuel saving is estimated at about 16% on an average. Boiler life is increased with waters containing over 10 grs. per gal. of scale forming constituents, 100% and with waters containing 20 grs., 200%. Boiler depreciation is probably reduced 75%.

UNDERGROUND WATER IN CRYSTALLINE ROCKS, F. G. Clapp. Eng. Rec. 60, 525–7. Crystalline rocks are classed, granite, gneiss, schist and diabase, of which the last is the hardest to drill. Water is present in these rocks in their joints, and hence the success of a driven well is dependent upon the chance of hitting one or more of such water-bearing crevices.

The flow is generally moderate, but of very good quality, soft and not high in iron. From the record of such wells up to the present time in New England it is concluded that 90% give sufficient water to supply a family. The probability of reaching this water under 100 ft. is about 85%, but driving beyond 200 ft. is not advisable. It is better in case of failure to start another well 100 ft. or more away than to drive deeper in the first place. The cost of drilling varies from $2.00 to $6.00 per foot and is in general less than that of blasting.

HOUSE APPARATUS FOR OZONIZING WATER, Neisser, M. Chem. Zent. 79, 2, 267–8 (1908–2). A description of a small ozonizer to attach to a house tap and connect with the lamp circuit. No details or costs given.

MINERAL CONTENT OF ILLINOIS WATERS, E. Bartow, J. A. Udden, S. W. Parr, G. T. Palmer, University of Ill. Bull. 6, 3, (Water Sur. Series, 4). A report of 547 analyses made during the years 1895 to 1905 to determine the composition of the mineral residue from waters sent in by parties interested in their commercial or medicinal value. 269 cities and towns and 90 out of the 102 counties of the state are represented. The report is given under the heads:

- Distribution.
- Geological Classification.
- Classification of waters according to chemical and physical characteristics.
- Methods and interpretations of analysis.
- Boiler Waters.
- Medicinal waters.
- Analyses—Table.

(H. R. HOSMER.)

BIOLOGICAL LABORATORY NOTES.

By FREDERIC P. GORHAM,
Associate Professor of Biology, Brown University, and Bacteriologist, Providence Health Department.

THE ISOLATION OF THE TYPHOID BACILLUS. Many laboratories have reported excellent results in separating typhoid and colon bacilli by the use of Endo's medium. Endo has described the method of preparing and using this medium in Centbl. f. Bakt. Orig. 35, 1903–4, 109. Klinger gives practically the same directions in Arb. a. d. Kais. Gesundheitsamt. 24, 1906, 52. Kastle and Elvove of the Division of Chemistry, Hygienic Laboratory, U. S. Public Health and Marine Hospital Service, Washington, D. C., report* certain difficulties which they have found in obtaining perfectly reliable and satisfactory results with this medium. They found that impure lactose and impure sodium sulphite seemed to be primarily responsible for the failures. The first can be overcome by using Kahlbaum's c. p. lactose, and the second by using pure anhydrous sodium sulphite in half the quantity originally employed by Endo. They give a method for the preparation of the medium which they claim gives excellent results. They also give an improved method for the preparation of pure anhydrous sodium sulphite.

Jackson and Melia also report† a modification of the well known Hiss method‡ which they claim has many advantages. *B. typhosus* may be found, they claim, even when present in small numbers. The method is applicable to water, milk, and feces. The method consists of a preliminary cultivation of the material to be tested in lactose bile as an enrichment medium and plating from this on Hesse agar to get the characteristic typhoid colonies. The lactose bile medium has been described by Jackson in Biological Studies by the Pupils of William Thompson Sedgwick, 1906; Jour. Inf. Diseases, 1907, Sup. No. 3, p. 30, also Amer. Pub. Health Assoc. Papers and Reports, 32, Pt. 2, 1907,

* Jour. Inf. Diseases, 6, 1909, 619.
† Jour. Inf. Diseases, 6, 1909, 194.
‡ Jour. Med. Research, 8, 1902, 148.

30; Jour. Pub. Hygiene, 18, 1908, 16, also Amer. Pub. Health Assoc. Papers and Reports, 33, Pt. 2, 1908, 101, and Hesse agar has been described in Zeit. f. Hygiene, 58, 1908, 441 and Centbl. f. Bakt. Orig. 46, 1908, 89, but Jackson and Melia give some modifications of the original Hesse method.

ESCULIN MEDIUM. Harrison and Van der Leck have reported* excellent results in the isolation of the colon bacillus by the use of a medium containing the glucoside esculin and iron citrate in which the colon bacillus produces a black colony which is easily identified. At the Boston meeting of the Society of American Bacteriologists, Mr. H. W. Lyall, of Brown University, read a paper in which he questioned whether the esculin medium had any advantages over the ordinary litmus lactose agar. He reported that several kinds of bacteria ordinarily found in water gave the same reaction as the colon bacillus and that their colonies could not be distinguished from the colon colonies. Klotz and Rankin come to this same conclusion.† They tested many strains of intestinal bacteria from man and found that even some strains of colon did not give the esculin reaction. Out of 62 different strains of 13 types of intestinal bacteria only 22 gave a positive reaction while 40 were negative.

* Centbl. f. Bakt. II, 22, 1909, 547, and Proc. Roy. Soc. Canada, 1908, S. III, 2, 105, and Centbl. f. Bakt. Orig. 51, 1909, 607.

† Jour. Inf. Diseases, 7, 1910, 67.

PUBLIC HEALTH LEGISLATION, NEWS AND NOTES.

By FRANCIS H. SLACK, M. D.,
Director, Boston Board of Health Bacteriological Laboratory.

TUBERCULOSIS TEST IN COURT AGAIN. Attention was called in the last issue of the JOURNAL to the Referees' decision in the action brought against the city of Milwaukee and Health Officer Bading to restrain them from enforcing the city ordinance which required that all cattle supplying milk to the city should be tuberculin tested.

Minneapolis and Commissioner of Health Hall of that city, have been passing through a similar experience. On April 15th, 1908, the Minneapolis city council passed an ordinance regulating the sale of milk in that city, which, among other things, provides as follows:

SECTION XIII. "Any adulterated milk, and any milk which has been drawn from cows which have not been inspected by duly licensed veterinary surgeons and tested by physical examination and the tuberculin test for the purpose of detecting the presence or absence of tuberculosis, and any milk drawn from cows where the owner or owners of such cows shall not have filed in the office of the commissioner of health, a certificate of the veterinary of the department of health of the city of Minneapolis, or of a duly licensed veterinary surgeon stating that such cows have by him been inspected as provided by Section X hereof; which has been brought into the city of Minneapolis, or is held and offered for sale in said city, may be seized and destroyed by an inspector or other officer of the department of health of said city authorized to inspect the same."

On the 18th of May, '08, the plaintiffs, consisting of six milk companies of the city, sought a temporary writ of injunction against the city and Health Commissioner, which writ was denied by the court.

The memorandum accompanying this denial sets forth in a convincing manner the charter rights of the city acting through its council to adopt such an ordinance and the authority of health officials to enforce it.

Jan. 26 and 27, 1909, the case came before the court for trial, without jury and being continued was argued and submitted to the court for its decision April 24, 1909. The decision was as follows: "As Conclusions of Law the court finds that the plaintiffs or any of them are not entitled to an injunction or any relief whatever in this action and that the defendants are entitled to have judgment for the dismissal of said action and for their costs and disbursements."

MEMORANDUM.

"The contentions of the plaintiffs upon the trial of this cause were substantially the same as those considered in the court's memorandum attached to the order on file which denied their motion for a temporary injunction except so far as they now assert that compulsory pasteurization is an inexpensive and certain protection against harmful bacteria in milk and cream and should be substituted for the methods prescribed in the existing ordinance complained of. It is, indeed, conceded that pasteurization adequately effected destroys the disease germs. But it is claimed on the part of the defendants that as a practical remedy it is ineffectual, both because the process itself as heretofore conducted is imperfect, and because to secure certainty as to results it would be necessary for the municipality to pasteurize all milk and cream consumed within the city, or to supervise the work by a large number of highly paid inspectors, each method, as it is claimed, involving undue expense and being in large degree experimental.

It is not the province of this court to decide between these respective claims of the parties. As was stated in the previous memorandum, when referring to the tuberculin test, "It was within the legitimate power of the city council, acting under legislative authority, to determine, as it has, that the test is a protection to public health," and is its province, also, to say that such test is a better protection to the community than would be the method proposed by these plaintiffs.

NATIONAL CONFERENCE ON HOOKWORM DISEASE.*—The First National Conference for the Study of the Hookworm Disease, held last week in Atlanta, Ga., was attended by three members of the Rockefeller Commission and by over two hundred physicians, life insurance officials, educators and commercial and industrial representatives. The principal address was by Dr. Charles W. Stiles, of the United States Public Health and Marine Hospital Service, who reported from personal examination of 128 mills in the Southern States that 25% of the mill employees are infected with the hookworm. Other speakers before the conference were Dr. Wyckliff Rose, of Nashville, Tenn., and Mr. E. E. Rittenhouse, President of the Provident Savings Life Assurance Society of New York.

HOOKWORM CAMPAIGN IN THE PHILIPPINES. The report of the Philippine Bureau of Health for the quarter of a year ending September 30th, 1909, states that at that time practically all of the residents of Las Pinas in the Province of Rizal, and from nearby villages numbering in all over 6,000 people, had been examined for hookworms. Of this number 24.2% of the males and 8.06% of the females were found to be infected, or an average of 16.13 per cent of the population.

About 90% of the entire population were found to be infected with some form of intestinal worms and frequently with two or more kinds. It is believed that in towns where conditions are approximately the same as in Las Pinas practically the entire population is afflicted with intestinal parasites of some kind. That this condition has an important influence in lowering the vitality of the masses can scarcely be doubted.

NEW LABORATORY FOR FLORIDA STATE BOARD OF HEALTH.† The State Board of Health is to erect a laboratory in Jacksonville, on property donated by the city at Raspberry Park. The proposed building will cost about $15,000, and will contain accommodation for experiments and investigation, incubator rooms, refrigerator rooms, offices, library and records. The laboratory is to be in charge of Dr. Henry Hanson, formerly of Milwaukee, Wis.

* Boston Medical and Surgical Journal, Jan. 27, 1910.

† Journal American Medical Association, Jan. 22, 1910.

REAPPOINTMENT OF ERNST J. LEDERLE, Ph. D., AS HEALTH COMMISSIONER OF NEW YORK CITY. On Jan. 10th last, Dr. Ernst J. Lederle was appointed, by Mayor Gaynor, Health Commissioner of New York City, in the place of Dr. Thomas Darlington. This is the second time Dr. Lederle has held this important position, having been Commissioner for two years under Mayor Low, 1902–3. The salary of the Commissioner is $7,500 and he is also the President of the Board of Health, the Board otherwise consisting of the Police Commissioner and the Health Officer of the Port (Dr. A. H. Doty). In order to accept this appointment Dr. Lederle resigns from his membership in the State Water Supply Commission, salary $5,000, and also from his position as Sanitary Expert of the Board of Water Supply of New York City, salary $10,000. As Sanitary Expert of this latter Board he had supervision of the labor camps on the Catskill Dam and Aqueduct, where work is now being carried on to increase the water supply of the city. These camps averaged a population of 15,000 persons during last year and their sanitary supervision required a regular health department organization and the utmost care in the disposal of sewerage and garbage, control of infectious diseases, etc.

Dr. Lederle brings to his new position a wide experience which should be of great benefit in his administration of New York City health affairs.

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EDITORIALS

THE PROBLEM OF VENTILATION.

The discussion before the American Public Health Association at its Richmond meeting on the various aspects of ventilation was a timely one. The problem of ventilation is largely an engineering problem, but, as in all such problems, the highest efficiency can be secured only by knowing accurately the conditions with which the engineer has to deal and the ends he must secure. Is the theory upon which we base our practice in accord with the advance of knowledge during the past two or more decades? This is always a good question to ask and especially with regard to matters involving costly and often inconvenient building construction.

The old idea that the purpose of ventilation is to keep the air reasonably free from carbon dioxid and supplied with its normal content of oxygen, has long since been given up. Rarely does

the carbon dioxid rise to more than 50 or 100 parts in 10,000, or the oxygen fall below 19 or 20 parts in 100, and we have no reason to think that this, of itself, is responsible for the effects of poor ventilation. At the same time it is by no means proved that the quantity of oxygen available to the body or the effectiveness of the removal of carbon dioxid from the body are without influence, for it is the quantity and especially the tensions of these gases in the lungs and not the quantity in the air of the room which is the important thing. It is not impossible that there may be various reflex or psychic interferences with the normal working of the breathing mechanism which result in deficient or perhaps in the equally undesirable over-ventilation of the lungs. Fortunately, the introduction of Haldane's simple method of analysis of the alveolar air now renders this subject capable of comparatively easy investigation, and it is to be hoped that our knowledge about it may soon be materially extended.

The failure to make the composition of the atmosphere in oxygen or carbon dioxid responsible for the results of poor ventilation led to the theory that the cause of the trouble is the presence of minute traces of extremely poisonous material in the expired air, and it was furthermore assumed, with utterly inadequate proof, that these poisons come from the lungs. Hence the teaching that while the carbon dioxid of the expired air is not itself responsible for the bad effects, it may be used as a measure of the imponderable or undeterminable poisonous material. And so there have been made thousands of analyses of air for this gas in the endeavor to measure thereby the efficiency of ventilation.

Expired air unquestionably contains material not present in normal air and these materials often have a very offensive odor. But it is not true that they are contributed chiefly by the lungs. Decaying food particles in the mouth, catarrhal exudates, uncleanliness of person, and the like are far more responsible for their presence. If this is so, it is perfectly clear that the carbon dioxid is NOT a measure of their amount. A room crowded with typical representatives of the great unwashed, who do not brush their teeth and have never occupied a dentist's chair, would certainly impart to any assembly room a flavor which could not be

given by the same number of individuals of cleanly habits; and yet the carbon dioxid content of the two rooms would in all probability be identical.

Nor is this all. Even granting that these offensive substances are present, it is not proved that they are poisonous, or at least to what extent they are poisonous. The fundamental assumption of all such theories is that in the bad effects of poor ventilation we are dealing with some sort of intoxication, i. e., with the action of a poisonous material reabsorbed into the body with the inspired air. Good as this assumption may be to serve as a working hypothesis upon which to base accurate investigation, we may confidently challenge the production of any adequate proof that poisonous material in the inspired air is the sole or even the chief cause of trouble. In other words, even on the theory upon which it is based, this measurement of carbon dioxid is an example of "barking up the wrong tree," wasted effort which the exercise of a little common sense would have saved.

Nor is the teaching of physiology lacking in indications of other and certainly equally important sources of trouble. A crowded, badly ventilated room is almost always an overheated room with an atmosphere surcharged with moisture. The heat comes from the oxidations going on in the bodies of its occupants, and every breath of exp'red air leaves these bodies not only with an increased percentage of carbon dioxid and possibly other material of organic nature, but saturated with aqueous vapor. In other words, the atmosphere of the room comes to repeat the conditions of a warm, muggy summer day. Indeed, it only requires an appeal to experience to see that there is a suspicious similarity in the effects of the two condition upon the human organism. The importance of these atmospheric conditions is, moreover, enhanced when we remember that it is not the general air of the room but that in immediate contact with the persons of its occupants which exerts the physiological effects in question. The writer cannot but feel that if more attention had been paid to the physical condition of the air within a few inches of the body and less to the general air in the room, the practice of ventilation would today be far more efficient, simply because it would have coped intelligently with at least two of the main evils.

The treatment of the practical problem of ventilation as a portion of the applied physiology of respiration takes far too narrow a view of the subject, and indeed this is recognized in much of our practice. In technological schools, courses usually combine the treatment of the subjects of heating and ventilation. But do they not generally look upon heating and ventilation as two separate things, instead of being, as they really are, two parts of the same problem? Of course, in such matters all depends upon our definition of terms and we may confine our conception of ventilation, if we will, to the supplying of "fresh air" to an inhabited room. At the same time it is no uncommon occurrence to get wrong points of view because of the previous adoption of unfortunate definition. Ventilation as it is popularly understood, and as we think it should be understood, is not simply the replacement of vitiated by pure air; it is rather the maintenance of ideal atmospheric conditions in a room, the correction of all undesirable atmospheric conditions, such as the presence of offensive and possibly poisonous constituents, too high or too low temperature or humidity, contamination from leaky gas fixtures, the updraught from damp cellars, and numerous others for which the practical engineer must be on the lookout and which he must understand how to estimate with approximate accuracy. The practice of ventilation as an art is perhaps more a case of the applied physiology of temperature regulation and the circulation of the blood than of the physiology of respiration; it is far more a physiological than a toxicological problem; and, more than this, it requires practical knowledge of many factors of domestic and public sanitation.

The practical side of ventilation should also take account, to a far greater extent than it actually does, of the variable nature of the conditions with which it must cope. The maintenance of ideal atmospheric conditions in a climate whose mean temperature is 75° is an entirely different proposition from what it is in one whose mean is 65°; it is entirely different according to the relative humidity; and the problem differs, above all, with the variability in these conditions from day to day. Has there not been entirely too much rule of thumb in our practice? Every treatise on the subject gives tables of the number of cubic feet of air which should be supplied to hospital wards, to school rooms, to factories, and so on. Surely it must make all the difference in

the world in what sort of climate these buildings are located. Formulae are excellent things but only when they are judiciously applied, and a good formula for Boston may be a complete failure for Denver.

We may also point out that it is almost certainly a mistake to seek for any single convenient test of the efficiency of ventilation. It is, of course, not impossible that some test may be found which would give an approxmiate measure of this efficiency; but there certainly is no such test known today, nor is it likely that it will ever be discovered. The determination of carbon dioxid, as above pointed out, has been lamentably overworked. The operation of this test by a chemist sent from the office of a ventilating expert may at first impress the layman who knows nothing of its significance with a pleasurable feeling that he is getting the worth of the money spent in installing a ventilating system; but too frequently the same layman is found a year or so later expressing his opinion of "these scientific fellows" in language more picturesque than quotable, and he is usually justified in doing so. Efficiency tests should certainly include temperature and humidity, and the results of all tests should be interpreted in the light of accurate knowledge of the conditions to be dealt with. After all, the final test is the experience of the occupants of the room. If your tests say that the ventilation is perfect while those who try it in their own persons say that the room is "stuffy," then something is wrong with the tests.

There is in this whole matter a large field for the very best kind of scientific study. These are days in which the virtues of fresh air are certainly not underestimated and the experience of clinicians points unquestionably to hygienic value in fresh air, which is at times almost miraculous. And yet the whole thing is on a purely empirical basis. No one has yet given a satisfactory explanation of the action of fresh air in the treatment of tuberculosis; and, so long as this is so, we must be applying the therapeutic agent more or less unintelligently, perhaps at times extravagantly. Similarly with regard to ventilation. Is it not time that the basic physiology and sanitation of the problem were being thoroughly reinvestigated, so that the weak points in our practice may be detected and the best results most inexpensively secured?

THEODORE HOUGH.

University of Virginia.

DAMAGE SUITS FOR TYPHOID FEVER.

The California State Board of Health Bulletin for October contains this statement: "The time will come when citizens will sue a city for damages resulting from typhoid fever, concerning which the city gave no warning, just as they now sue for damages resulting from a fall into a city excavation over which no warning lights were placed."

At first thought this sounds rather absurd, but a test case would bring to light facts which would cause the city's attorney some anxiety. There are few people in whom the following story does not stir some memory of a friend.

"John Doe died yesterday of typhoid fever. He leaves a young wife and two small children. The city, as well as his family, has suffered heavily in the loss of this influential young business man, who has been prominent in the important work of the Civic Improvement Association. His death was caused by milk from an infected dairy, and the citizens are demanding the re-establishment of milk inspection, which was quietly discontinued last spring by the trustees as a measure of economy."

What about Mrs. Doe and the two children? John Doe was twenty-five years old. He carried $10,000 life insurance and was receiving a salary of $1,800 a year. Both the life insurance companies and the wife had every reason to believe that he had at least 30 or 40 years of active business and civic usefulness before him. Even if his salary were not to be increased, his earnings thus cut off represent from $54,000 to $72,000. His $10,000 policy was a large one for a young man on a small salary, but still it was manifestly poor business for him to die. Just suppose this young wife should sue the city for $60,000 damages on the ground that the city had voted funds for a proper control of the milk supply and that the council had diverted these funds to other uses without warning the citizens. What would the verdict be? Arguments introduced to show that a city can not ensure safe milk to its citizens could be controverted by evidence from cities that have done it. Arguments showing that this young man might have died shortly of some other disease would

be no more valid in this case than in hundreds of successful damage suits against cities for deaths from accidents due to municipal carelessness.

The time may never come when such damage suits will be filed, but it will not be because they are less logical than suits for accident damage. The records of most typhoid fever outbreaks show that not more than one out of each ten cases dies, but the remaining nine who recover suffer heavy losses. Few typhoid fever convalescents find their expense has been less than $300, counting fees for doctors, nurses, drugs, and possibly loss of wages. Any person can estimate for his own community what typhoid fever has cost during a series of years. The citizens of the majority of our states are spending collectively upwards of $2,000,000 or $3,000,000 annually for this one disease.

There is probably no way in which an efficient public health administration could be established more promptly than by the institution of a series of prosecutions for gross neglect of municipal health protection.

The chance illustration of typhoid fever infection through contaminated milk could be paralleled by costly epidemics due to many other agencies for the transmission of the typhoid bacillus (polluted water supplies, sewage-irrigated vegetables, unscreened fly-infested toilets, typhoid carriers).

The history of "Typhoid Mary" is tragic and very naturally excites our sympathy for Mary, but a careful judgment between the right to liberty of the "Typhoid-Marys" and the right to protection from typhoid infection of their many victims must favor the victims. The restriction of liberty of the individual as a measure of protection to the public is an unquestioned practice in all diseases which the public fully believes to be dangerous. This is true of the innocent leper, the unfortunate insane, the harmless imbecile, even the unsightly deformed in many countries. Typhoid fever patients and carriers are far more dangerous to their fellow-citizens than any of these, but the public does not realize this. Many physicians even do not realize it to the extent of instituting effective precautionary measures in all typhoid fever cases.

Until the public is fully awakened to the business importance and practicability of public health protection, the old order of

things will not materially change. This awakening has begun and will go forward with accelerating speed. The educational movement for health conservation is about to be supplemented by practical application in representative communities throughout the United States.

As people become better informed on these matters they will begin to ask questions when their neighbors become ill or die from some preventable cause. They will vote money to build fortifications against the invisible armies of disease just as they now vote money for protection against human foes. Adequate provisions will be made for a standing army of sanitarians and a public health militia.

It will take time for the majority of American voters to realize that for the protection of our lives plate glass in our tenement houses is more important than armor-plate in our sea-walls; that sanitary officers must be equipped with microscopes and a laboratory, as soldiers are with guns and powder magazine; that a public health militia requires training in the use of soap and water, sunshine and fresh air—their form of military tactics. But every student of current events must recognize that the irresistible movement for health conservation which is now sweeping over the country will eventually bring these things to pass.

Today the surgeon whose operation is followed by infection is expected to explain satisfactorily how it happened or face a suit for damages. This has come about through the careful application of "preventive medicine" principles to the environment of the patient during the period of the surgeon's responsibility. These same principles of prevention of disease may be applied just as effectively to the environment of a community. But it must be remembered that the surgeon only assumes responsibility under known conditions. He requires a trained nurse, the equipment of a hospital, his patient's compliance with every detail of his instructions. The specialty of surgery is as old as the history of scientific medicine, and the people appreciate and respect the advice of the surgeon.

Public Health is also a specialty in medicine, but there are few physicians fully qualified to practice it, and the people have only recently begun to learn its value. Slowly the idea is being

grasped that just as there are many diseases known as "surgical," in which the general practitioner desires the advice of a surgeon, so there are many diseases known as "communicable," in which the general practitioner should ask for consultation with a public health specialist. As this idea gains ground it becomes apparent that to be of real service to the general practitioner and to warrant his respect the public health specialist must prepare himself as does the surgeon, by special study and wide experience. A general practitioner with a political appointment as health officer in his pocket is not a public health specialist likely to inspire respect and hearty co-operation from his fellow practitioners. When the public has studied these things out, adequate salaries will be voted for retaining the services of practical highly trained specialists to protect the public interests in all cases of communicable diseases. It will be their duty to serve as consultants to the general practitioners, and there will be no criticism attaching to the physician's care of his patient when the public health specialist requires certain measures carried out which are of no importance to the patient but are of vast importance to the public welfare.

The military point for attacking the typhoid fever bacillus lies at the bedside of the patient. The lack of appreciation of this strategical fact by the attending physician is shown whenever the care of a patient is entrusted to "practical" or novitiate nurses whose inexperience permits the daily escape of typhoid bacilli from their patients. Every health officer knows physicians in his community who make guess-work diagnoses and who are not qualified to issue adequate instruction concerning the protection of the public from their typhoid cases. And yet the health officer may only suggest to these physicians that he would gladly come in as public health consultant, make blood and urine and other examinations in any continuous fever case, and supervise the necessary measures of prophylaxis—suggestions which are rarely made and more rarely accepted. The health officer is still further limited by false medical ethics which hold him silent before recognized incompetency of physicians in charge of communicable diseases. The result of all this is that the public health officer, instead of beginning an active scientific fight at the bedside, must wait on the outside of the house and

guess what particular avenue of escape the invisible enemy is going to find open to it.

The recognition by both family and general practitioner that the trained public health officer is of the same value as a consultant in communicable diseases, as is the surgeon in surgical diseases would enormously increase the efficiency of public health work. It remains to be seen whether the general practitioner will lead in the creation of this new specialty or whether he will be forced by an educated public to recognize it and to do his duty in co-operating with its representatives. So long as practicing physicians who have neither experience nor native ability for public health work are willing to accept the responsibility of the public health office, so long will an uninformed public continue to limit its appropriations to a salary of ten to fifty dollars per month and refuse to provide laboratories or to comply honestly with regulations which displease them.

W. F. SNOW.

Sec. California State Board of Health.

IS HOUSING REFORM WORTH WHILE

Employers of unskilled labor are constantly and with reason inveighing against its inefficiency, its intemperance and unreliability. The charge is not a new one but, with the increasing congestion of our population in cities, it has been made with greater frequency in recent years. The man on the street, if he thinks at all of its cause, is very sure to attribute it to intemperance, without realizing that this in itself is symptomatic rather than causative. Men get drunk because they are undervitalized and ill nourished much more than for any other reason and intemperance increases and emphasizes the causes of their inefficiency.

We have ceased to attribute disease to a mysterious dispensation of the Almighty and we lay the blame, or a large share of it, on filth of one sort or another. We are very insistent that our water and milk supply shall be uncontaminated, that our food shall be pure and that flies shall be kept away from it, and we talk almost hopefully of the ultimate annihilation of tuberculosis, of typhoid, of smallpox and other diseases.

Social workers and sanitarians have for many years recognized the analogy between shiftlessness and poverty, vice and crime on the one hand and disease on the other, but such has been the influence of the individualistic philosophy and theology that the idea of a social causation for social ills has been of very slow growth. Only within a comparatively few years has it been realized that a man born of an undervitalized mother, living all his life in unsanitary and immoral surroundings, put into the factory at ten or twelve and constantly under-nourished, has very little opportunity for developing efficiency and that for him the doctrine of free will and individual responsibility becomes very tenuous.

All of these debasing factors deserve careful study and chief among them the conditions which surround him in his home, for there he passes nearly, if not quite, half of his lifetime, and there, as a rule, he is subjected to conditions of insanitation far worse than those in the factory or on the street. It is there that we must look for most of the incidence of disease. Squire and

Hulbert, after a careful study of conditions in London, reported to the International Congress on Tuberculosis that "among the poor the source of tuberculosis must generally be sought in the home rather than in the workroom or the street." The death rate of the entire city of London is 15.6 while that of the worst slum districts runs from 40 to 50. Lagneau has shown, from statistics collected from 662 cities in France, that the denser the population, the greater is the number of deaths from tuberculosis; the death rate being, in cities of 5,000 inhabitants, 1.81; in cities of 20,000, 2.71; in cities of 100,000, 3.05; in cities of 450,000, 3.63; while in Paris the death rate is 4.50.

The Medical Officer of Health of London reported in 1898 a similar condition in that city. In districts where there was less than 10% of overcrowding the death rate was 1.10; where there was less than 25%, the rate was 1.80; under 35%, the rate was 2.42, and over 35%, 2.63.

The experience of British cities, while recruiting for the Boer War, is significant as showing how congestion tends to physical degeneration, Manchester, for example, being obliged to reject, as physically unfit, 8,000 out of 11,000 applicants. Glasgow, a city where 87% of the population live in houses containing three rooms or less, took the physical measurements of 72,857 school children and classified their height and weight in correlation with the number of rooms in the houses in which they lived. The results were most striking. The average height of boys whose families lived in one room, was 46.6 inches; of those who lived in two rooms, 48.1; three, 50 inches and four or more, 51.3. The average weight increased in the same way from 52.6 pounds to 64.3 pounds.

The influence of unsanitary housing is twofold; first, by reason of the fact that the dwellings, having insufficient light and air, permit the indefinite preservation of pathogenic bacteria; and second, the unsanitary conditions induce an anemic condition of the body and render the individual, subjected to its influence, incapable of vigorous labor, prone to the use of artificial stimulants and markedly susceptible to disease.

In quite as serious a way, bad housing reacts on the moral constitution of the tenement dweller. Almost invariably these conditions cause a weakening of the moral fiber and a loss of

ideals. Crowded together three and four in a room, modesty is next to impossible, and cleanliness a work of supererogation. The situation is still further complicated by the frequent, if not general, practice of attempting to reduce the high cost of rent by the introduction of the lodger into the family, with results almost invariably pernicious.

Under such conditions, it is futile to expect that there will be very much of home life. The father escapes to the saloon, the boys to the street and the girl to the cheap theatre and the dance hall. The wonder is, not that the result in drunkenness, in prostitution and in crime is as bad as it is, but that it is not worse.

Our American cities are just beginning to wake to a realization of what these conditions mean and will mean. New York has been struggling with the problem for years and more recently Philadelphia, Chicago, Pittsburg, Louisville, St. Louis, New Orleans, Los Angeles and Washington have undertaken investigations along these lines, in an attempt to determine a future policy. Conditions in each city are individual and the problem must be solved by each in its own way.

Legitimate property interests must be conserved but as Letulle so well said before the International Congress on Tuberculosis, "The right of property must not be carried to the extent of legalizing an attempt on the life of one's neighbor."

Even in our newer cities, conditions, which are now more or less sporadic, are becoming each year more general and the longer that a radical revision of their building laws is postponed, the more difficult will be the task when it is at last attempted. The slum is inevitable unless it is prevented by well enforced legislation. It needs no legislation to create it.

High tenement buildings are no necessary mark of the slum. Its constituents are more frequently the small family dwelling house transformed for multiple occupancy, the cottage in reduced circumstances, or the shack thrown together out of waste materials. The sleeping room which has no direct connection with the light and air, the unsewered privy vault, the surface well, generally close beside it, the cellar apartment, are so common in our younger cities as almost to escape notice, while in our older towns, although they may be free from some of these evils, have conditions of overcrowding which make the problem a most

serious one. The sublime confidence with which a builder will erect a building the full width of his lot, trusting that his neighbors on either side will not do the same, is more remarkable than praiseworthy and that his confidence is misplaced is evidenced by the existence of very numerous examples of buildings where only such rooms as front on the street or the yard receive any direct light and air and the others depend on a scant supply which may filter through a grimy window and a dirty room.

It is an old and quite gratuitous slander that the poor do not appreciate sanitary surroundings. The fact, which will be testified to by everyone who has had personal experience with them, is quite the reverse. But whether they do or they don't, the state and the city, from motives of self preservation, if for no other reason, ought not to permit its citizens to live under such conditions for, in inefficient labor, in the budgets of hospitals, asylums, reformatories and prisons, in the contagion which, starting in the slums, does not stop there, Society sooner or later pays the bill.

JAMES THAYER GEROULD.

The University of Minnesota.

COUNTY OFFICERS OF HEALTH.

Since the enactment passed in England in 1847, in Section 12 of the Towns Improvement Clauses Act, to the effect that the Commissioners in any local district may "if they think fit," appoint a person of competent skill and experience who shall be styled the "Officer of Health," till the present, the evolution of the medical officer of health has been the most accurate measure of the development of Public Health as a function of government, and as the illustration of social advancement. The telegram sent at the same moment as King Edward pressed the button in England, which opened the new Tuberculosis Dispensary in Montreal in October, 1909, stated that as the pressure of the button which opened the doors, turned on the electric lights and unfurled the Union Jack, showed the marvellous progress of science, so he did not doubt that the same scientific progress would be shown to be equally applicable and effective in the field of preventive medicine.

Everywhere the work to be done by the medical officer of health is now being recognized and the methods of doing it have in large degree been elaborated; but the manner of its execution is that which urgently demands our serious consideration. The last word said on the subject in England is in the clause which the Hon. John Burns, President of the Local Government Board, insisted upon last year, even against the House of Lords' amendment, that County Officers of Health should give all their time to the office and that their tenure should be permanent. This point, however, has been reached very gradually. Not until 1872 was it made compulsory that each urban and rural authority should appoint an official to be known as the Medical Officer of Health; but there was nothing stated as to the extent of his duties, his permanency or his salary. Not till 1888 was the next real step taken, when there was a general reorganization of municipal government, resulting in County, District and Parish Councils, the first advanced step since 1839 which first gave local government, as we understand such, to the people of England. The need and reasons for this development were obvious. Tiny

industrial towns as in Lancashire and the Midlands had grown in a generation into populous centres, slums had grown up around insanitary factories; "trout streams were converted into foul sewers and every open space was a rubbish heap."

What has happened in England has within a quarter of a century taken place on this Continent with even more startling rapidity, and those who have watched the growth of population and the increase of cities, the enormous development of industries and the growth of a complex urban social life, are today anxiously seeking for machinery adequate for dealing with the health problems confronting us. Investigations in scientific laboratories, whether University, State of Provincial, or in those of the great industrial corporations, have provided an abundant knowledge to guide us in our operations toward protecting the public health; but the people through their Federal, State and Municipal governments have not as yet supplied the administrative machinery by which we can effectually bring such knowledge to bear on public health problems. What we are needing is what England has at last arrived at—a system of District or County Officers of Health, standardized as to their scientific knowledge by a degree in Public Health, paid sufficiently to devote their whole time to the Public Service and protected in their duties by the application of the Civil Service code of permanency of tenure in office. There is no need to argue this point today, since everywhere both in the United States and Canada, as well as in England and elsewhere, it has become apparent that scientific progress means specialization in any field of work, and the supply of workers is dependent upon permanency of employment and adequate remuneration.

We shall therefore concern ourselves only to enquire how this is to be brought about in practice. In England, in Canada and in most of the States there have grown up, side by side, dependent largely upon density or sparseness of population, two fairly distinct municipal systems, illustrated by Bryce in his "American Commonwealth," as the "county system' illustrated in Virginia where large plantations existed, and the "township" system of New England which grew out of the old town meeting. Some provinces and states have, however, both systems as in England, the larger area having originally relegated to it such matters as

highways, justice and secondary education, while many other matters, especially health, were local parish or town matters. But since public health has become a serious study, demanding the application of exact science, students of Public Health problems have been seeking on this Continent the remedy found in England of so uniting the public health units of a number of smaller districts as that the cost to the ratepayers for a permanent and efficient public health service shall be minimized. It is apparent to all officials, whether municipal or state, who have had practical experience during the past twenty-five years, that until this consolidation has taken place no further local health progress is generally possible. In many states this consolidation has long existed in primary education. The Counties appoint qualified inspectors of schools who, in some provinces at least, are paid by Provincial "grants-in-aid," as in England, up to 50% of the salary. In Public Health matters the greatest advance which the writer is aware of on this Continent is where the state or province encourages efficiency by one or several state medical inspectors, investigating local epidemics or advising in matters of public water supply and sewerage.* But in a Province as old and as municipally advanced as most on this Continent, the writer has for twenty years proved fully the inadequacy of the seven hundred or more local township, town and village Boards of Health with as medical officer a local practitioner competing with his medical rivals, paid from nothing to $25.00, $50.00 or $100.00 a year, for doing mostly nothing and, if charging fees during an epidemic for special services, almost invariably having his bills questioned or refused, and if he forced payment being dropped with loss both of money and prestige.

The remedy suggested by the writer many years ago is simply that system applied partially in England, but effectually applied in Canada in primary school work. It is that of a County Med-

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* Massachusetts, in 1907, passed "An Act to provide for the Establishment of Health Districts and the Appointment of Inspectors of Health." There are fifteen Districts and fifteen Medical Inspectors "learned in the science of medicine and hygiene," appointed by the State Board for five years, but liable to removal from office by the Governor and Council at any time. The salaries are to be paid wholly by the State, but as only $25,000 was voted, it will mean that Medical Inspectors will not give all their time to the work. This, with the limited time of the appointment and the power of removal at any time through political influence, greatly lessen the value of what otherwise marks a great advance in Public Health administration.

ical Officer of Health, with a public health diploma from some University Medical School of recognized standing in his State or Province, to be appointed by the County Council, and who shall receive an adequate salary and devote his whole time to public health work. As it is the question of the cost which will be the primary difficulty, the plan apparently most applicable, at any rate to Canadian practice, will be for a percentage, say 50% of the salary, to be paid by the State or Province through the State Treasurer on the Certificate of the State Board of Health, that on the one hand the initial salary paid by the County is adequate, when supplemented, and on the other that the County Officer is performing efficient work. The tenure of office would be permanent, every officer, however, being subject to investigation under the General Law relating to Official Investigations in any State or Province. Dependent, of course, upon the density of population, the area for which such an officer would be appointed would be roughly one having from 20,000 to 30,000 population, including towns and rural areas. Commonly in Canada the area for which a member of the Provincial or State Legislature is elected, would prove a practical unit. As in the older States and Provinces, these areas are within the boundaries of a County, it makes the application of the Municipal County System easily possible.

To lend dignity to the office and maintain its work in close relationship with the county organization, a County Board of Health, to meet quarterly or more often in emergency, should exist, to be composed of the Warden or elected head of the county council, ex officio, and either the senior or junior county judge, along with the medical officer. Such a Board, composed wholly of officials, would add nothing materially to the cost, while questions of health, finance and law would have brought to them the experience of men trained to consider each. The health machinery would of course be: (a) The laboratory, required to have a minimum of equipment supplied by the county, satisfactory to the Provincial or State Board, located centrally and convenient to the work by both rail and telephone; (b) In those counties where some institution as a county tuberculosis hospital or sanatorium existed, it would often be found of real practical utility to have the medical officer placed in charge, have

the laboratory there, and so centralize and enlarge his work; (c) As the county contains a number of townships, towns and villages, which may have already a sanitary officer, these would become as in England automatically the local officers of the County Officer, with duties defined under the law, such as reporting daily when necessary all notices of contagious diseases, and carrying out routine inspection, disinfection and policing; (d) The medical officer would similarly receive directly from physicians, or through the local inspectors, reports of outbreaks of contagious disease, and from all practicing veterinarians notice of contagious disease in animals, affecting the public health. (e) The medical officer would similarly be medical inspector of the schools of his district, and would naturally carry out the physical inspection of the school children, as well as the inspection of school buildings and the control of contagious diseases. (f) He would also put into force a systematic supervision, not only of the factories in towns, but especially of the rural factories as of cheese, butter and fruit canning. (g) He would likewise systematize, through the township inspectors, the examination of dairies and the supervision of public milk supplies. (h) He would especially through local veterinarians discover herds where tuberculosis existed, and would gradually organize a meat inspection service through centralizing the slaughter of meat to be sold to the public.

Since the practice is rapidly developing of having in county areas at least one sanatorium for cases of tuberculosis, whose management will naturally come under the county medical officer, and as no more convenient or necessary means can be found for a County Officer keeping in touch with the local medical profession than a laboratory, where in addition to the routine examination of swabs, sputum, etc., he can examine pathological specimens by definite arrangement, it is evident that an amount of work properly belonging to a County Officer has been outlined, which, if performed, would entitle such officer to the position, which a Medical Officer of Health should hold, as the most elevated and important office in any community.

In Canada, where an old-time practice has existed of appointing as many coroners as there are medical men caring to make application, an anomaly exists where the coroner's "quest"

often approximates a scientific farce. A dead body is found under suspicious circumstances and a post mortem is ordered, and at times carried out by some practitioner who probably has made no post mortem since his college days. Were a Medical Officer of Health for the County appointed, with the duties of medical examiner in legal cases as a part of his duties, the State would be assured of having this most important work done on scientific lines.

The progress of Municipal Public Health work, remembering how there was no scientific basis for much of this work as regards a knowledge of the causation of disease until thirty years ago, has been more rapid by far than that of primary education; and today when, apart from the humanitarian side, the economic value of a human life to any community is beginning to be realized, it is a matter of certainty that those larger methods of organized co-operation so necessary in epidemic work, the control of food supplies and industrial operations will soon result in machinery whose effectiveness can even now be seen on every hand.

PETER H. BRYCE, M. A., M. D.

[Chief Medical Officer, Dep. Interior, Canada.]

SPECIAL ARTICLE

A METHOD OF SEALING TEST TUBES TO PREVENT EVAPORATION OF CULTURE MEDIA.

By W. L. BEEBE,
Bacteriologist for the Minnesota Live Stock Sanitary Board.

Many times it is advantageous to store a considerable quantit y of culture media in test tubes. As it is very hard to keep it for any length of time without evaporation, the writer tried several methods of sealing the tubes. Most of the methods that were tried were found to be more or less faulty and did not prevent evaporation absolutely. Finally, a method was devised that has proven very satisfactory and has been used in this laboratory for the last three years.

It consists of a square piece of glass covered with sealing wax pressed down on the top of the tube while the tube is hot enough to melt the wax. In the writer's experience the best results were obtained by the following procedure: the glass sealing wax caps are easily made by cutting window glass into squares of from three-fourths to one inch. These are thoroughly cleaned and dipped into very hot sealing wax, thus covering them evenly. They are then dropped into a dish of cold water which cools the wax before they reach the bottom of the dish so they do not adhere to one another. Bacteriological test tubes which are thicker than the ordinary tubes should be used. It is desirable to use tubes without a lip because thin tubes are frequently broken in removing the cap. It is advantageous to have the top of the tube ground if the edge is uneven. The cotton plug should fit rather loosely so that they can be flamed and pushed down just below the mouth of the tube. The tube is then heated sufficiently to melt the sealing wax where the rim of the tube comes in contact with the wax. The glass sealing wax cap is firmly pressed down upon the mouth of the tube and held

in position for a few seconds and then placed in an upright position in a test tube rack until they have cooled. Tubes that have been sealed by this method have been kept in this laboratory for over three years without evaporation.

The caps are easily removed by tapping them on the underside with some instrument, such as a scalpel. Usually a small amount of wax will adhere to the mouth of the tube, but this is easily removed with a scalpel. The plug is then drawn up in position with forceps. If any sealing wax is present on the plug it is usually advantageous to flame the tube and turn the plug around in the tube two or three times while the tube is cooling. If this is done the sealing wax on the plug will be of no disadvantage. The wax is easily removed from the used tubes by putting them in chromic acid cleaning mixture for a few hours.

American Public Health Association

AGE PROBLEMS IN INDUSTRIAL HYGIENE.*

By OWEN R. LOVEJOY,
General Secretary, National Child Labor Committee, New York City.

Those interested in the social phases of industrial improvement certainly appreciate the opportunity given by this Association to call to the attention of your distinguished body some of the facts gleaned in a field investigation of these conditions. It is my purpose briefly to outline a few points at which our work enters the same field and to ask your interest and co-operation in making the work of such organizations most effective.

One factor fundamental to all the work of organizations interested in children industrially employed can be supplied only by the active co-operation of public health officials, namely birth registration. It is a notorious fact that in large sections of this country no laws requiring a record of birth are operative, while in many sections of the country having such laws the facilities for their enforcement are so unequal to the task that but faulty records are secured. Even in New York City, where the law is unusually advanced and its enforcement administered with unusual efficiency, we are told that it is far more difficult to get age records of children born in that city or in other parts of our country than of children who come from Italy, Poland, Bulgaria, Spain or other European countries.

The relation of age to industrial employment is so obvious that discussion should be unnecessary. Nevertheless, we meet constantly an ignorant or indifferent public which assumes that adult burdens may properly be borne by children of any age, provided they are made proportionate to the child's size. Public health officials and physicians can do more than any other group of officers to make evident that certain periods in childhood are

*Read before the American Public Health Association at Richmond, October, 1909.

extremely critical, in view of the revolutionary physical changes occurring between the 10th and 16th birthdays. Probably not even the days of infancy are more hazardous than these.

For this reason the occupation of such children should be carefully guarded, especially from the standpoint of physical development. Whatever jeopardizes the health or physical efficiency of the child places so heavy a handicap on the future, whether from the educational, moral or economic view, that its conservation is fundamental. Children of the age mentioned should have something useful and inspiring to do, and the work in which the National Child Labor Committee engages is not an attempt to promote the idleness of children. On the other hand, it is our aim to so guard the years of childhood and early adolescence that when children come to the age at which industrial burdens of any importance can reasonably be borne, their bodies and minds are fitted for the burden. The present process of pushing them into economic employment for profit at the early age customary in many sections of the country is wholly unscientific.

It is unfortunate that no authoritative statistics can be furnished, as in older civilizations, to give an accurate chart of the social liability we incur through premature employment of children, or through employment of youth in industries entirely unfitted for any save adults. A Bulletin has recently been published by the Bureau of Labor, compiled by one of your members, Dr. Kober, which is the best study thus far made on the subject in this country. In the bulletin the author deplores the fact that statistical information is so meager. It is to be hoped that through the establishment of the proposed Federal Children's Bureau, so thorough and systematic a study of this subject may be made that we shall have a truly national basis for action. In default of any such government standard, it obviously rests upon local physicians and health officials more than on any other group of citizens to make public the serious nature of the forms of child employment that predominate in many localities.

A more dramatic phase of the relation of age to employment appears in a study of accidents. So far as the meager statistics in various states give evidence, it appears that children 16 years of age and under show almost uniformly a higher percentage

than adults in the same industries. This is true not only in coal mining operations, where the hazard is palpable, but in the general run of industrial occupations coming under the supervision of factory inspection departments. This is due not only to the physical frailty of the child, who lacks power of resistance, but chiefly to the mental characteristics of youth. Children are careless of danger and expose themselves to perils the adult will avoid.

We have for years spent millions in the building up of our army and navy and police systems, in the development of penal and reformatory institutions, sanitoria and health resorts, for the protection of society against foreign enemies and for curing those who fall victim to disease, but thus far our people have been extremely conservative in their meager appropriations for the preservation of the public health. In my judgment the present agitation against tuberculosis, typhoid and other preventable diseases is so emphasizing health considerations, that within the next decade we may expect the local health authorities to become the real important branch of our state and local governments. So important a field requires the skill and devotion of the very highest type of our citizens. That the present importance of this work should be more keenly appreciated, let me urge that local boards of health, or associations of local physicians, shall vigorously push a campaign to secure power to weigh and measure all children in the community whose physical condition is not adequately supervised by the public school.

The inappropriateness of many industrial occupations for children is now pretty well recognized throughout the country, but up to the present time occupation in agriculture has usually been looked upon as a form of employment free from danger and promotive of the highest interests. Recently, however, our attention has been called to sections of the country in which truck gardening and the preparation of fruit for canning and preserving offer so serious a menace to the health and morals of children as to require careful consideration and regulation. Perhaps the most startling arraignment of agricultural conditions thus far made is by Dr. Charles Wardell Stiles, of the United States Public Health and Marine Hospital Service, who,

together with his associates, has been making a study of the hook-worm disease in Southern agricultural communities.

Doubtless many of the irresponsible magazine writers, always eager for sensation, have embarrassed Dr. Stiles and his fellow workers—as they have wronged us—by persistently contrasting the hook worm with the cotton mill. They picture the cotton mill as a blessing to the germ-cursed millions of the South and intimate that when all facts are known, child labor advocates will see the wrong they have done Southern children by seeking to exclude them from the mills. I confess it is a little difficult to follow their argument. One hundred years of experience in textile industry in England and many years' experience in this and other countries have produced evidence convincing to leaders in the medical profession that child labor in textile mills is injurious. The claim is even made that for strong, healthy, well nourished children, the textile mill is detrimental, that the long hours, moist atmosphere (particularly in cotton mills) and eye-strain in many departments are a menace. Yet we are now asked to believe that children diseased, poorly fed, half-clad, whose vital organs and life blood are being sucked away by the hook-worm, are benefited by the long hours and hard labor of the cotton mill.

The contention that the cotton mill is the only alternative to hook-worm is not borne out by the teachings of Dr. Stiles. He claims that from 15c to 75c worth of medicine will cure the disease. If this is true, the cash outlay is certainly a more economic investment than the dedication of twelve year old boys and girls to a twelve hour day or a ten hour night in a textile mill. Investigations of hook-worm show that it is perpetuated and propagated chiefly by soil pollution. Valuable instruction is given by Dr. Stiles and others for the purification of soil in the vicinity of dwelling houses and for the proper construction and care of sanitary toilets, where adequate sewerage systems are not available. If there were a guarantee that every family from the sand barrens who moved into a cotton mill village would follow these instructions implicitly, the hope of curing the disease by migration would be increased; but everyone familiar with such communities knows that not over one per cent of the people literally follow the instructions of Dr. Stiles and other sanitary

experts. If the disease is due to soil pollution, what guarantee have we that in ten years the ground of the cotton mill villages will not be as foul as that in the vicinity of the old farm-house in the hills? Should it become polluted, we shall face the necessity of curing hook-worm disease in a mill population which, although better housed and better fed than formerly, will lack the resisting power of those who live in the open air.

The present situation with regard to this subject is extremely unfortunate. Every person in the South interested in the factory employment of little children is today quoting the statements that purport to come from these Government officials, but which doubtless in reality have come from the publicity experts of popular periodicals, as a defence of the exploitation of the little child. That due regard should be given to interests of primitive communities is recognized, and in many instances families who migrate from their remote cabins in the sand hills to the newly built cotton villages, find the economic necessities of the new environment extremely hard. The low standard of wages in many of these mills lays a heavy burden on the family purse and one can readily understand the eagerness of the parent to utilize the frail services of infant hands to eke out the family income. But that the employment of tender children for a ten or twelve hour day is a necessity in that or any other part of the country, is emphatically denied. The time has come when the standards of our country must indignantly repudiate the principle that our industrial progress and the domestic independence of our people are built on such a foundation. Frankly, it puts the manufacturers who defend this child employment in little better light to follow their line of excuse for child labor. Science and experience taught that factory labor tends to make children pale and to interfere with their physical development. Now we are met by a class of practical economists who tell us that instead of making children sick in their factories, they are engaged in the employment of sick children.

If conditions of farm life are as much worse than conditions in the cotton mill as we are led to believe, we have a two-fold reason for a most persistent, vigorous campaign of education in sanitary reform. Instead of appearing as hostile, there should be the most cordial and intimate co-operation. I bespeak the

representatives of the National Child Labor Committee in saying that we welcome all information that can be gathered regarding abuse or neglect of little children anywhere, and so far as that abuse or neglect relates to or may be affected by their industrial occupations, we stand ready to use all our efforts in their behalf.

The standards of regulation endorsed and actively promoted by the National Child Labor Committee may be briefly summarized as follows:

(1) A fourteen year age limit for all industrial occupations.

(2) Beyond this a careful scrutiny of the physical and educational development of the child, on the theory that physiological and mental age development are far more important than a mere chronological record.

(3) The protection of all children sixteen years of age and under, which shall include:

(a) Exclusion from all occupations dangerous to life or health.

(b) Prohibition of night employment.

(c) Restriction of the hours of labor to an eight hour day.

Beyond this we recognize the importance of guarding the moral interests of our communities to the extent of still further regulating the employment of those engaged in industries that involve a hazard to the moral life. Among these may be mentioned employment in night messenger service, which in time will doubtless be forbidden to all minors.

The National Child Labor Committee is a voluntary organization of citizens representing all parts of the country and seeking at this one point to defend the American child. We do not attempt enforcement of the law or an exhaustive accumulation of statistical information. On the other hand, we aim to co-ordinate the interest of intelligent citizens and furnish moral and political backing, so essential to the effectiveness of the work of public officials. In the name of this Committee I desire to pledge your association our utmost efforts to make effective the advanced standards for the preservation of the public health, which are the basis of your activities and lie at the foundation of our Commonwealth.

THE PROTECTION OF FACTORY EMPLOYEES AGAINST DUST ARISING FROM CERTAIN OCCUPATIONS.*

By WILLIAM C. HANSON, M. D.,
Cambridge, Mass.

Massachusetts has two laws relating specifically to the protection of employees in factories and workshops against dust which is generated in the course of manufacturing processes or which is caused by manual occupation. These laws are enforced by the State Inspectors of Health under the supervision of the State Board of Health. One law provides that if it appears to a State Inspector of Health that the inhalation of dust caused by any manufacturing process would be "substantially diminished without unreasonable expense by the use of a fan or by other mechanical means, such fan or other mechanical means, if he so directs, shall be provided, maintained and used." The other law provides that emery wheels and belts and buffing wheels and belts shall be equipped with hoods, suction pipes and fans or blowers; that the fans and blowers installed shall be of proper size and run at effective speed, and that the pipes and connections shall be approved by the State Inspectors of Health. The only grinding machines and emery wheels to which this law is not applicable are the "grinding machines upon which water is used at the point of contact" and "solid emery wheels used in sawmills, in planing mills or in other woodworking establishments," and "emery wheels six inches and under in diameter used in establishments where the principal business is not emery wheel grinding."

In guiding the inspectors, the first point upon which stress is laid is that the emphasis of danger in relation to a given industry should be placed where it belongs. For practical purposes the inspectors are taught to classify all conditions which arise from an industry which directly endanger the health of the employees into three groups: (1), those which are avoidable; (2), those which are to a certain extent avoidable; and (3), those which are

*Read before the American Public Health Association at Richmond, Va., October 20, 1909.

entirely unavoidable. In this way the problem of determining to what extent it is practicable to render harmless dust or other impurities injurious to health is made much less difficult, while the opportunity for an inspector to fall into the error of requesting manufacturers to make changes which they cannot reasonably be expected to make is practically eliminated.

The textile industry employs a larger number of persons in its factories than any other industry in Massachusetts, and the majority of employees are women and minors. Associated with the cotton industry are dangers which are direct and obvious in their effects upon the health of the workers, and for this reason the manufacture of cotton goods has been considered a dangerous trade. In justice to the industry, however, and to those manufacturers who are progressively attacking, from a commercial point of view, the very problems which go hand in hand with improved hygienic conditions, it seems to me that we might very properly lay more emphasis upon the avoidable dangers which, if removed, will go far toward taking the cotton industry from the list of "dangerous trades." The fact that the work of cotton mill employees involves more or less constant confinement in a dusty atmosphere cannot, of course, be overlooked, even in the best regulated fine grade goods mills; but a careful consideration of other factors than cotton dust which affect injuriously the health of the workers shows that too little thought has been given to the evil consequences of poor light—especially in certain departments—excessive heat, nauseating odors and irritating gases, the products of gas combustion, the lack of proper means of ventilation, and the failure to regulate properly the introduction of artificial moisture, and want of cleanliness.

Poor light—itself a factor of no mean consequence in reducing the physiological resistance to disease—may be a concomitant of a number of other unsanitary influences, as for example, in the weaving and spinning rooms, or it may be the principal factor, as in web drawing. Even in a weave room, it is possible that the injury to employees caused directly or indirectly by insufficient light is as great as that due to dust, which in this department is generally slight in amount. Add to poor light, unnecessarily high temperature and excessive moisture, want of cleanliness and lack of provision for a plentiful supply of fresh air, and we have

a most important group of conditions to deal with which are very largely avoidable. Again, in the ring spinning rooms there are avoidable objectionable conditions common to most cotton factories in addition to the cotton dust or "fly," which in this department varies from a slight to considerable amount.

In short, the presence of dust in the air of cotton workrooms does not appear to be a prominent feature in its influence on health except in the first few processes which cotton undergoes after being taken from the bales. That is to say, the intrinsic danger in the industry, practically unavoidable at the present time, lies chiefly in the opening, picking and carding processes, the danger varying with the construction of the mill, the amount of dirt and other impurities in the stock—depending upon the grade of stock used—the means of removing some of the dust and other factors.

In thus presenting the facts it is not my intention to underestimate the importance of taking all practicable measures to eliminate cotton dust, so far as possible, in all departments, from the opening room to the cloth room. I do believe, however, that by calling to the attention of the public the avoidable dangers connected with the cotton processes with the same degree of emphasis that has for years been put upon the dust problem, which, from the nature of the industry, always will be to a certain extent unavoidable, much more good may be accomplished, for in this way all, or nearly all, of the avoidable objectionable conditions may be eliminated and the exact danger caused by the cotton dust in the several processes can then be more accurately judged.

In the absence of a law specifying the standard of sanitary conditions, State Inspectors of Health are instructed to use as standards the conditions which they find existing in those factories carrying on similar business in similar buildings within the Commonwealth where the health, safety and welfare of the working people are most completely protected.

Another example of an industry which is intrinsically dangerous to health is the pearl industry, in the manufacture of pearl buttons and ornaments. Here, unlike the cotton industry, the dust problem is practically the only one of importance, so far as the health of the employees is concerned. That is to say, the

essential factors favoring health are two: (1), a reasonably good room to work in, and (2), the efficient removal of pearl dust. Unlike the cotton industry, too, all but one of the processes are attended with serious danger, even with most approved methods of removing the pearl dust, because fine pearl dust, in quantities not appreciable to the naked eye, escape in the air near the employees who are constantly handling pieces of pearl shell. Much can be done, however, to safeguard the health of workers in this industry by installing and maintaining suitable dust-removing devices, as the following facts show. In two of seven pearl factories, or factories where pearl working is done as a part of the trade of jewelry making, the cutting machines were found to have no hoods or exhausts, owing, perhaps, to the fact that the process of cutting appears to give rise to the least amount of dust of any of the machines used in the dry processes in this industry. In the pearl working room of one of these factories, where the processes of cutting, sawing, grinding and doming pearl shells were conducted, there appeared to be but a slight amount of dust. On the other hand, in another factory all the processes in the pearl workroom were attended with the production of great amounts of pearl dust, in spite of dust appliances on all but the cutting machines. Again, in a pearl workroom in a factory where all the machines were equipped with appliances for protecting employees from dust, there appeared to be more dust than the appliances could take care of. On the other hand, in the pearl workrooms in another factory where every machine creating pearl dust was equipped with hoods and exhausts, including the process of wet sawing, there was no appreciable amount of pearl dust in the air of the room, and the conditions as to cleanliness were very good. A study of this small group of pearl factories brings out the following points which are of value:

1. With every machine except the cutting machine supplied with a dust-removing device, there may be but a slight amount of dust to which employees are exposed.

2. With every machine except the sawing and cutting machines supplied with a dust-removing device, all the processes may be attended with the production of great amounts of dust to which employees are exposed.

3. With every machine supplied with a dust-removing device there may be more dust to which employees are exposed than the appliances can take care of.

4. Every machine may be supplied with such a dust-removing device that no appreciable amount of pearl dust can be detected in the air of the room. In the first case, it may be a fact that the process of cutting pearl shell gives rise to the least amount of dust of any of the machines used in the dry processes in this trade. This is not sufficient reason, however, for failure to equip the cutting machine with a dust-removing appliance. The second and third instances illustrate how a factory may apparently be well supplied with apparatus for the removal of dust, but on careful examination the apparatus found quite ineffective and the employees not properly protected against dust. The fourth instance shows how the health of the working people is best protected, viz.: By equipping and maintaining every machine with hood and exhaust in such an efficient manner that no appreciable amount of dust can be detected in the air of the room, and by maintaining otherwise a high standard of cleanliness. The fact remains, however, that, with the most improved processes of manufacture, employees in the pearl industry are always subjected to a certain amount of dust which, being a non-metallic mineral dust, not only irritates the throat and trachea, causing one to cough and to clear the throat by expelling mucous with dust, but may, over a period of years, extend its action to the lungs and give rise to shortness of breath and other symptoms of dust-diseased lungs, or of tubercular complication. For this reason, I believe it none too radical a step to bring such pressure to bear upon the manufacturers of mother-of-pearl goods as will prevent the employment of either boys or girls under eighteen years of age.

At this point the speaker showed a series of lantern views of some of the best mill rooms in Massachusetts, where the conditions as to light, ventilation, gases, humidity, etc., are practically ideal. Views of processes in the pearl and other dusty industries were then shown with the object of laying emphasis on certain industries and processes which are of special hygienic importance either because of conditions inherent in the industry or because of those which should not be connected with the industry.

Six months later the Legislature of Massachusetts passed the following Act relative to the employment in dangerous trades of minors under the age of eighteen years:

Chapter five hundred and fourteen of the acts of the year nineteen hundred and nine is hereby amended by striking out section seventy-five and inserting in place thereof the following:—SECTION 75. The state board of health may from time to time upon the written application of any citizen of the commonwealth, or upon its own initiative, after such investigation as it considers necessary, determine whether or not any particular trade, process of manufacture or occupation, or any particular method of carrying on such trade, process of manufacture or occupation, is sufficiently injurious to the health of minors under eighteen years of age employed therein to justify their exclusion therefrom, and every decision so rendered shall be conclusive evidence of the facts involved therein, except so far as the same may later be revoked or modified by a subsequent decision of the board. Whoever, after being notified that the state board of health has determined that a particular trade, process of manufacture, occupation or method is injurious as above stated, employs therein a minor under eighteen years of age shall be punished by a fine of not more than two hundred dollars and not less than fifty dollars for each offence, unless prior to the time of such employment such determination shall have been revoked or modified so as not to include the employment complained of. (Approved April 16, 1910.)

THE VENTILATION OF INDUSTRIAL ESTABLISHMENTS.*

By Dr. C. T. GRAHAM ROGERS,
Medical Inspector of Factories, N. Y. State Labor Dep't.,
New York City.

I regret that my first words in appearing before this learned body should be an apology for the incompleteness of the paper about to be presented; but owing to shortness of time, and a large number of uncompleted reports of investigations into special industries, as well as the necessity of having my yearly report in the hands of the Commissioner by November 1st, it was an impossibility to look up important reference matter, and so present my part of the subject in a manner as satisfactory as I could desire.

While it has never been really expected of, or possibly even thought that a Department of Labor would have anything to do with the betterment of Public Health, nevertheless, it is a fact. That the Department of Labor of the State of New York has done much in this line cannot be doubted after reading the Annual Reports of the Department, and looking over the various sections of the Labor Law relating to the subject; besides, the Commissioner of Labor has sent a representative of the Department to participate in the meeting of this Association, whose object is the betterment of public health.

One of the subjects to which the Department has given considerable thought and attention during many years past, has been that of ventilation. In his Annual Report of the Factory Inspection Bureau for the year 1905, the Hon. John Williams, then head of the Bureau, and now Commissioner of Labor, recommended the securing of an apparatus for the testing of air in workrooms. The Hon. P. Tecumseh Sherman, former Commissioner of Labor, realizing the importance of properly handling the question as well as all sanitary matters, did much to secure the creating of the office of Medical Inspector of Factories.

*Read before the American Public Health Association at Richmond, Va., October, 1909.

Immediately upon appointment by the Hon. John Williams, and during the fiscal year 1907–1908, the time of the Medical Inspector was devoted entirely to questions of ventilation. Not being an expert in factory ventilation, or a ventilating engineer, his energies were bent toward securing CO_2 determinations, and the finding of a method or apparatus most suitable for accurate determination, that would be not only portable, but easily manipulated, and give rapid readings. The Pettersson & Palmquist apparatus was finally decided upon to start with, and has now been so modified as to be very portable.

Some 136 workrooms, and over 430 separate air tests were made during 6 months of the fiscal year of 1908, and a complete tabulation of the results may be found in the Eighth Annual Report of the Commissioner of Labor.

At present, the work of the Medical Inspector consists in making special investigations into individual industries, and so covering the entire broad field of Industrial Hygiene, but still giving considerable attention to the ventilating question.

Pure air is as essential to good health as is pure food and water, and is of economic value to the worker; hence, ventilation becomes an important subject in the study of Industrial Hygiene, but is unfortunately, a much neglected one. Great strides have been made in improving the ventilation of schools and dwellings, but comparatively little has been done regarding factories. It is true that considerable research work has been done regarding the questions of contamination by products of respiration and combustion, and some regarding dust and fumes, but it is too bad that so little real work has been done by the members of Medical Profession regarding the relation of proper ventilation in industries to morbidity statistics; especially as their income is derived mostly from the workers. Outside of recommending plenty of air, very few have undertaken to determine the purity of the air so recommended. The real research work has been left to those who are not physicians.

Despite many years of untiring energy of the New York State Labor Department, devoted toward securing means for, and maintaining of proper and sufficient ventilation in workrooms, and the unfortunate necessity of bringing prosecution for non-compliances, there still remains much to be accomplished. It

certainly has awakened not only the manufacturer to a recognition of the economic necessity for providing ventilation, and so in many cases securing compliance, but it has also awakened the ventilating engineer to a realization that systems planned and installed merely from blue prints and contracts, are not always effective and at times are mechanical impossibilities.

In the furtherance of the Department's endeavors to secure compliance with ventilation orders, the Medical Inspector has relied upon the older authorities declarations of CO_2 being a good standard in determining the impurity of air, and need for ventilation, but from results of a great many determinations for CO_2 made in workrooms of various industries, (which possibly cannot be exceeded for number or variety), it has become apparent that to do more intensive work, secure better results, and that all bodies directly or indirectly connected with betterment of health conditions of the Public, as well as the Public may more fully awaken to the dangers of impure air and poor ventilation, it is necessary to obtain a unanimous agreement of scientific opinions upon the following questions.

What constitutes impurities?

What shall be the standard for permissible impurity?

How shall we determine the impurities?

What remedy shall we apply?

In all places excepting industrial plants, and even in some of these, we have merely to deal with impurities resulting mostly from products of respiration and combustion, so a standard of impurity based upon CO_2 determinations may suffice, but in the industries we have dust, fumes, gases, vapors, and extremes of temperature and humidity, plus the products of respiration and combustion. Here a difficult problem confronts us; what shall we say are impurities of sufficient moment to insure ordering means for ventilation? While we may know of the deleterious, or even toxic quality of the dust, gas, fumes, or vapor present, the proprietor will not admit the atmosphere is impure, and in many instances the workers, having undoubtedly become habituated, show no outward evidences of its ill effects, and unfortunately we have little or no reliable morbidity statistics to aid us.

Then arises the question: What shall be the standard of permissible impurities?

Carbon dioxide in excess of a certain amount has always been accepted as a standard, but there has been quite some difference of opinion as to the permissible amount; nevertheless, where the question is merely one of contamination by products of respiration and combustion, it is undoubtedly satisfactory, but where we also have dust, gases, fumes, vapors, and extremes of temperature and humidity to deal with, what shall be our standard, or must we have a number of arbitrary standards for the various conditions in each industry? This is the problem confronting those dealing with ventilation of industrial plants. To those whose duty requires the bringing of prosecution proceedings for a refusal to ventilate, what scientific standard may be offered in defence of issuing the order?

During the months of June, July, and August of this year, determinations of CO_2 and temperature and humidity readings were secured in a large number of cellar bakeries, situated in the various parts of New York City. All tests were made after dark, and for comparison, outdoor readings of CO_2 temperature and humidity were obtained. The means for ventilation in the majority of places visited consisted of small windows over the oven, and a stairway to the street or rear yard. It is a general opinion that cellar air is far from pure, and it is very evident that where a baker's oven is present, there will certainly be some coal gas; this, with illuminating gas being used, and extremes of heat and humidity, would very naturally lead us to expect high readings of CO_2, the usual findings were 7–8–9, in but very few instances were any higher readings obtained. These were all volumetric, and represented parts in 10,000 vol. In an investigation of the pottery industry, the results of CO_2 determinations showed from 7 to 10 parts in 10,000 vol. Outside of the dust the air seemed as fresh to the senses as outdoors. Results of tests in a polishing and buffing room, where large quantities of dust came from rag buffers, and tripoli used on wheels showed only 7 to 8 parts CO_2 in 10,000 vol. But in the tailoring industry, tests made with windows open showed as high as 32 parts in 10,000 vol. in midst of workers, and at the open window, readings showed 21 parts. From this we may see that in but one instance is our CO_2 standard alone, a sufficient indicator of need for ordering means for ventilation to be installed.

Valuable data has been secured by the Department through tests for CO_2 having been made by the Medical Inspector in the following industries: Cigars, Clothing, Furs and Fur Goods, Hats and Caps, Kid Gloves, Laundries, Paper Boxes, Printing and Publishing, Calico Print Works, Pearl Buttons, Human Hair Goods, Shoes, Carpet Weaving, Tin Cans, Potteries, Bakeries, Jewelry, Buffing Brass and Copper. In addition to tests made in industries, tests were also made in the basements of Department stores by Deputy Mercantile Inspector Vogt of the Department.

The apparatus used in making the determinations was the Medical Inspector of Factories, modification of the Pettersson & Palmquist apparatus; all tests were made and readings were taken directly upon the spot. Each sample was 25 c. c., and readings were parts in 10,000.

Did we base our orders merely upon CO_2 determinations alone, unhealthful and dangerous places would be permitted to exist. Apparently then CO_2 is but a partial standard; should the standard then be one which would not only specify the proportion of CO_2, but the proportion of dust free from all irritating particles or fibres, certain bacteria, absence of irritating, noxious, or toxic gases, fumes, and vapors, and a certain degree of temperature and humidity?

Or, should we, in dealing with industrial plants, take the accepted analyses of pure country air as a standard, and decide that where anything in the form of dust, gases, fumes, or vapors, may be found in addition, it shall be considered an impurity, and ventilation ordered? This brings forth the question, what shall be a standard method for determining the impurities? It is true that we have many methods of analysis based upon certain principles, but in prosecution we should have an available standard that may be appreciated by the laity, otherwise our work is of no avail.

Analytical methods are slow, and require time, patience, and careful manipulation, especially where very accurate results are necessary; but where the question of health is involved, may we not set a limit of fineness, and have a standard method of easily and quickly determining the presence of impurities, not for

accurate scientific data, but for convincing the laity of the need for proper ventilation, and thus accomplishing much good.

Even while realizing what a difficult problem it is, I believe that a great amount of energy should be devoted toward securing some means of impressing the laity, and of being able in prosecution work, to definitely show the danger, without having to enter into scientific discussions which as a rule merely tend to confuse Court and Jury, and many times does much to lessen the standard of the professions in the eyes of the public.

What remedy shall we apply where the air is impure? Here it might be said we trespass upon the ground of the ventilating engineer. I rather think this is where prescriber and dispenser should work together. Shall we depend upon natural means alone, or must we install artificial means, and if artificial, what shall be the system installed? In industrial plants, natural means alone are not to be relied upon, as proven conclusively by results of tests, and with the so called window ventilators installed, conditions were found to be but very little improved, notwithstanding extravagant statements to the contrary. It is true that in certain small industries confined to small rooms in converted dwellings, where contamination is merely the products of respiration and combustion, and where it is almost an impossibility to install motor means for ventilation, window ventilators of the check valve type could be used, and aided by lighted gas jets placed above the heads of the workers, and thus a certain amount of circulation might be insured. In this case while it must be admitted that the gas is a source of impurity, it is also an aid in creating sufficient heat to assist in causing air circulation. This fact is borne out by the extensive experiments carried on by Rideal as to "Relative hygienic values of gas and electric lighting" (Journal of Royal Sanitary Society, March, 1908, Vol. XXIX, No. 2). It is most unfortunate that a living room only was used.

If a system is decided upon, which is best? Theoretically and from results obtained, the combined plenum and exhaust appears to be the best, but it is costly. Not being a ventilating engineer, it is beyond me to enter into a discussion of the various other systems, fans, etc., but this I do know, that the results of CO_2 readings made during the operation of various systems, has shown the superiority of the combined plenum and

exhaust. The mere introduction of a blower or exhaust fan is no guarantee of ventilation, for if the exits or intakes are not kept open, the fans may be running at a high speed yet very little air will be moved; again, they may be the means of introducing large quantities of dust, or of creating cold draughts, thus increasing instead of remedying bad conditions, or, arrangement of system may be such that air currents are so far above the heads of workers as to be useless. The result of an investigation of the effect of ventilating fans in restaurants, dwellings, laboratories and public places in Brussels, showed a larger amount of bacteria per cm. of air with the fan running than when still. This is especially true of the small electric cooling fan, for the results of tests made in 1908 by the Department, showed a much larger amount of CO_2 in the air current created by the fans, than in the other portions of the work room.

The cry in the past was for more light, now it is for more air; we need both, for sunlight is essential to pure air, and especially in factories, but both must be unadulterated to be of service; because they are the free gift of the Great Creator, they are refused, and even avoided; even by those who should spread the glad tidings of its benefits is it neglected, as for example: At the request of a lecturer in a large Dental College, CO_2 determinations were made in various parts of the lecture hall, during his lecture, time 4:30 P. M., 115 male students present, electric lights, windows closed. T. 62:. H. 59.

CO_2 at lecturer's table, 13 to 16 parts.

CO_2 at lower rows of amphitheatre seats, 16 parts.

CO_2 to upper rows of amphitheatre seats, 17 parts.

This is in my opinion a bad state of affairs. If the professions neglect to provide proper ventilation, what can we expect of the laity.

A most worthy aim then should be not only the securing of scientific data and creation of scientific standards, but the education of the laity to observe certain homily standards, so aiding in increasing the physiological resistance of the body to disease, making the nation stronger, not only physically, but mentally and morally.

[3120 Broadway.]

THE SEX PROBLEMS IN INDUSTRIAL HYGIENE.*

By MRS. FLORENCE KELLEY,
Secretary of the National Consumers' League, New York City.

We are profoundly unfortunate in America in having no basis of knowledge on which anyone can intelligently discuss the subject assigned to me. We have begun feebly to scratch the surface of this subject, but we have no basis on which anyone can present an intelligent paper. All that we can do is to indicate our lack of knowledge. For more than one hundred years working men have lost no opportunity to make public, in every way open to them, their conviction that the most important step that can be taken towards protecting the health of women and girls in industry is to shorten their working hours. It is more than a century since the working people of England first began their effort in the name of the public health to get a shorter day for women. In 1847, during the agitation in Parliament for the ten hours working day for women and children in England, Lord Macaulay was asked in the House of Lords: "How do we know that there will be any improvement in the health of the working people if this bill passes?" He said: "We have no body of knowledge, we have no body of facts, there is no experience from which we can prove it, but the human mind knows that it is bad for women and little children to spend more than ten hours a day in any indoor occupation." That was in 1847. The bill carried, and it was largely that speech of Lord Macauley's which carried it through the House of Lords. But in 1895, in the enlightened State of Illinois, the Supreme Court of that State held that it was contrary to the Constitution of the United States and to the Constitution of the State of Illinois, to grant to women in Illinois the same degree of protection from fatigue which had been granted to women and children in England in 1847. The court was unanimous. It spent 9,000 words in explaining why it was contrary to those Constitutions to protect the health of women in Illinois in that way. The Illinois statute of 1893 was annulled, and to this day women in Illinois have no

* Read before the American Public Health Association at Richmond, October, 1909.

protection against overwork.† It was good law in England since 1847 and good law in Germany since 1891. It was good law for several years following 1886 in New York, but in the great majority of our cities today it is perfectly lawful to require women to work in a factory, or laundry, or store from ten to twenty hours, or any number of hours that any rush order may require.

Two years ago a case involving the ten hours day for women was pending before the Supreme Court of the United States. A distinguished New England lawyer, Mr. Louis D. Brandeis, freely gave his services in the interests of the working women and in defense of the law. Mr. Brandeis told my young assistant to compile all the information that could be laid before the court under the heading of "common knowledge" on this subject. The common knowledge of the world with regard to fatigue had to be gathered together for the use of the Supreme Court of the United States. My assistant worked for three months. She had readers at work and twelve libraries co-operating. They piled up a great amount of common knowledge of the whole world with regard to fatigue in working women. When she was about to print, I said: "How are you getting along with the brief?" She said: "When it is done we ought to print as its title: 'What every fool always knew; it is bad for people to get over-tired.'" However, a wise man said to us: "You will have to admit that, although every fool does know it, some of the wisest men have not yet acted upon it, for look at the decision of the Supreme Court of Illinois."

When I was asked to address this body I was filled with fear that it might seem that what I had to say was only what every fool has always known. I became convinced, however, that there are many medical men in the United States, wise men, who have not acted on this knowledge which we have delivered to the Supreme Court of the United States.

We had for some years a statute in New York providing that girls should not work in stores after ten o'clock at night; that they should have seats, and should be free to use the seats whenever such use did not interfere with the active per-

† Since the meeting was held, the Illinois Court has reversed itself and sustained the new ten hours law for women

formance of their duties. It was left to the Departments of Health of the cities to enforce that law, and it was never enforced. There was one particular Christmas when there was a little spurt of enforcement as to children under sixteen, but there was never any real enforcement as to girls between sixteen and twenty-one. The number of seats was never complete in the stores. When we reproached a Commissioner of Health he said: "We cannot. We have no time to look after details like that. We have to fight smallpox and tuberculosis. We cannot go and find out whether Jane Smith is over fourteen years or under, or whether Jennie Jones has a seat to sit on or not; we have more important things to do."

I had then a young neighbor who came to New York from the west of Ireland, a broad shouldered intelligent girl. Her father was killed in an accident. She went to work in the dress-making department of a store in New York City. She was a highly skilled fitter of sleeves into ladies silk waists. Very few girls could exchange work with her because few were as skillful. She was required just after Christmas to work six weeks from eight in the morning till six in the evening, and then to work three nights in the week until nine o'clock. She was given half an hour for supper. She had an unusually intelligent mother who kept hot cocoa for her when the girl came home late and weary. She was given a tempting luncheon to carry with her to eat cold at noon. But she was more tired each day and her appetite lagged. Maggie Sheehan was just as effectively killed by her employers and by the failure of the Commissioner of Health to enforce that ten hours law as if they had given her an overdose of strychnia. Perhaps you may say that young peasant girls who come from the west coast of Ireland are peculiarly subject to tubercuslois. So they are, and therefore, they ought to have extra consideration. You may say that Maggie lived perhaps in an infected tenement house. It is likely that she did. The great number of our tenement houses are breeding places of tuberculosis. But that is the reason why Maggie Sheehan ought to have had extra care. She is one of tens of thousands of girls who have been killed by overwork because our officials have thought they had more important

things to do in fighting more sensational forms of disease, instead of doing such humble things as enforcing shorter hours of work and protecting the resisting power of the young so that they can live with their germs. Everyone knows that we all live or die with our germs just in proportion to the amount of resisting power we have for them.

The common knowledge we gathered together was presented to the Supreme Court two years ago, and they decided that it was not only the right of the State of Illinois but the duty of every State to restrict the working hours of women. Before that decision was handed down we had only time to scrape together 162 pages of common knowledge. We have been at work at it ever since. We have now a mass of common knowledge on the subject and it is a disgraceful thing that only one page of it is furnished by America. We have no medical literature on the relation of sex to industry.

About twelve years ago the miners of Utah decided that they needed in the interest of their health a short working day. The Supreme Court of that state agreed with them, and held constitutional the statute establishing for the miners the eight hours working day. The case was appealed to the Supreme Court of the United States, which said that, whenever it could be shown to the satisfaction of the Court that the restriction of the working day of adult men was indispensable to the public health, it was within the power of the state to enact such a law. Since then fifteen States have shortened by statute the working day of all men and boys who work underground.

A few years later the bakers in New York City, who also work underground, because they work in cellars with rats and filth, decided that they needed a shorter working day. They were modest and only asked for a ten hours day. The case was appealed to the United States Supreme Court who said that it had not been shown to the satisfaction of the court that baking was an injurious occupation; if it were, the mothers of the country would have shown the evil effects of baking throughout our history, which they had not done. The judges were not acquainted with the underground bakeries of our great city. Unhappily the bakers' legal counsel had not been fore-

warned that it was necessary to lay before the Court the common knowledge on the subject, so the bakers lost their case.

Two years ago when Mr. Brandeis laid before the Court the common knowledge with regard to the relation of fatigue to the health of women, the judges did not inquire at all whether the work under discussion, which happened to be laundry work, was intrinsically dangerous, like work underground in the mines, or whether it was not intrinsically but only incidentally dangerous, like the work of a baker in a cellar, which is incidentally dangerous by reason of the preventable conditions under which it is done. The judges did not inquire whether it was intrinsically or non-intrinsically dangerous. They said that in view of the mass of 162 pages of common knowledge before them, ten hours work was enough for any woman to do in a laundry, factory or mechanical establishment.

Why do the Health Officers in all the cities of the United States not rise up as one man and tell the truth, which their deputies must know if they do not, that the great majority of the loaves of bread baked under the conditions under which baking is done in American cities are not fit to eat? The loaves are commonly exposed to the marauding of rats and cats, and all insects, and to sewage, to tuberculosis germs, and to the palms of the hands of bakers, many of them unfit to touch their own food, much less yours and mine. I was four years inspector of factories and shops, and I know whereof I speak. It is a grave sin of omission of the Health Officers of this country that any woman is in danger of buying bread such as all women are liable to buy today. I understand that Dr. Evans has closed many of the cellar bakeries in Chicago. I understand also that the cellar bakeries of Milwaukee are in process of being closed. So long as the women of the United States have to depend on having the law enforced for them, we are all of us in danger of feeding poison to the men of our families.

Sometime there will be sufficient common knowledge to induce the Supreme Court of the United States to reverse its decision and shorten the working day of the bakers, but in the meantime the shame remains that, in gathering together the great body of common knowledge as to the relation of fatigue to

disease in the case of the rapidly increasing millions of women who have to earn their own living in industry in this country, we got far more valuable information from Italy than from the whole of the United States. We have but one page of literature gathered in our own country. I hope you will fill out this vacuum before the next decision comes along.

THE RELATION OF LIFE INSURANCE TO PUBLIC HYGIENE.*

By Dr. LEE K. FRANKEL,
Metropolitan Life Insurance Co., New York City.

Probably in no other civilized country would it be necessary today to explain the relation of insurance to industrial and social hygiene. In countries like Germany, Austria, Switzerland and Holland, in fact, in practically every European country, the question of insurance has for decades been co-related with that of hygiene and the prevention of disease. In certain European countries, insurance is compulsory on certain elements of the population. Where, under such compulsion, sickness or old age insurance has been developed, and even where such development has been voluntary, it is found that the insurance of the workman presupposes not only his care while ill, but his protection against the ravages of disease.

In large cities, such as Berlin, Vienna, Leipzig, and Dresden, concerted and centralized efforts have been developed tending to the education of insured workmen along the lines of hygiene and preventive medicine. Not only is the insured workman entitled to treatment and medical care but every effort on the part of the centralized bodies is directed to educating the insured either through the distribution of pamphlets or through lectures so that he may know how to guard himself and to prevent sickness.

Very recently, insurance companies in the United States have taken up this question of the education of their policy-holders and have distributed pamphlets indicating how life may be prolonged. The entire question was brought to the notice of the insurance public during the past year in a very able paper by Professor Irving Fisher, in which he called attention to the opportunities open to insurance companies to educate their public, so as to reduce mortality and to prevent morbidity.

I must become personal in the remarks which I wish to make from now on and direct your attention to the work being done

*Read before the American Public Health Association at Richmond, October, 1909.

along preventive lines by the company which I represent, namely: The Metropolitan Life Insurance Company. Some months ago, this company applied to the Superintendent of Insurance of New York for permission to erect a sanatorium for the treatment of tuberculosis. Since then, it has distributed a pamphlet entitled: "A War Upon Consumption," to its Industrial policyholders. The company has in contemplation the distribution of other literature which shall guide the policyholders and enable them in a measure to prevent occurrence of other diseases. The company, as you are probably aware, writes largely so-called "Industrial" insurance. The policyholders under this form of insurance belong almost entirely to the industrial classes, that is the wage-earners, of the United States.

In developing this form of insurance, the insurance agent not only writes the policy but visits the policyholder weekly and collects the premiums. We believe that for this reason we have built up a rather unique piece of machinery which may be utilized for the improvement of our industrial policyholders. Since the agents visit the policyholders at stated intervals, we feel that they can be made use of as agencies in the fight against disease. Our agents distribute the pamphlets, which we are issuing and are being instructed to give assistance in other directions in helping policyholders learn the rudiments of hygiene and to become acquainted with the modern development along these lines.

Carrying out this thought, it is readily realized that an insurance company may be more than an organization which insures the lives of individuals. We believe that an insurance company which caters to the working classes has not done its duty merely in protecting its policyholders against death. Life insurance should help the policyholder during his life as well. It should enable him not only to protect his family when he dies, but by the instruction which the company may give, the policyholder may be taught to so protect himself that he will not succumb readily to purely preventable diseases.

The records of the company show, for example, that 18% of the death claims which we pay are due to tuberculosis. At age twenty-four, 48% of our death claims are due to tuberculosis.

This is the age at which a man ought to live and not to die. If we can help to stamp out this disease, we can give these men a longer lease on life. We do not believe that there is any charity in this; it is merely the combination of business with altruism. As a social program, the company is stepping in and taking the families of our policyholders by the hand and trying to prevent that waste of life which is occurring year after year and day after day.

Referring for a moment to the pamphlet entitled: "A War Upon Consumption," we have distributed over four million copies of these to our policyholders. It is an elementary treatise but we believe it meets the needs of the class of policyholders with whom we deal. We describe the causes, methods of cure and methods of prevention of tuberculosis. In addition we have printed a list of sanatoria, hospitals, dispensaries, etc., in the United States, in which treatment for tuberculosis may be obtained and these, as well, we are distributing among our policyholders.

As you can readily understand, an insurance company has certain limitations under the law and it is a question to what extent such a company may go in the care of its policyholders. As it is, a policyholder is not only a policyholder but a citizen as well, and as such he has the right to seek the provisions for safeguarding health which communities may prepare for their citizens. It is our desire to co-operate with all these agencies, particularly with the health officers and health boards so that our machinery may be availed of in the direction of preventing tuberculosis and other preventable diseases. At the present moment, we are co-operating with health officers in various cities. We wish to co-operate with the health officers of all cities and towns in the United States as our policyholders are to be found in practically all of them. The value of such co-operation is indicated by the results obtained last winter in the city of Chicago. Our agents in that city distributed "The Little Ballot" through which those interested in the sanatorium movement brought the question of the erection of a municipal sanatorium to the notice of the voters of Chicago and we feel that through such distribution we were instrumental in securing a large vote in favor of a sanatorium. We hope you will realize that our agents

are at the disposal of health officers anywhere for similar movements.

May I speak of another thing we are doing? At the present moment we are conducting an experiment in the cities of New York, Boston, Baltimore, Washington, Chicago, Cleveland and St. Louis by sending visiting nurses to all of our sick policyholders in these cities. We are of the impression that in time such service may show a reduction in our mortality. Even if it does not, we feel that the visiting nurse will be of inestimable benefit to the sick policyholder since most of them would be unable to obtain such service unless we send it. We are unable to say at the present moment, what the cost of such service will be or whether it will eventually become permanent.

In conclusion, I again wish to accentuate our desire to co-operate with the various health movements in the United States. The insurance companies are vitally interested in these campaigns. If they can reduce mortality among their policyholders, it means that the policyholders will eventually benefit by such a reduction. It will mean that the companies will give lower rates than is possible at present. Owing to the fact that we are an Industrial company, we have the special ability to place our agents who visit our policyholders weekly at the disposal of health officers. In the name of the company, which I represent, I take this opportunity of extending whatever co-operation may be in our power.

THE PHYSIOLOGICAL ASPECTS OF VENTILATION.*

By THEODORE HOUGH,
University of Virginia.

It is an old story, that of the man who was unable to go to sleep in a strange hotel because he could not open the window before retiring; finally, in sheer desperation, he threw his iron boot-jack against the glass and broke it; after which he fell into a profound slumber which was undisturbed until daylight awoke him and revealed the fact that he had only broken the mirror which formed the door of his wardrobe.

I cannot say that this incident ever happened, but I have no doubt that the story truly illustrates one phase of the physiology of ventilation. namely the large rule which the psychic factor plays in it. If one knows that the air is bad or believes that the room is close, physiological results often follow which would not otherwise occur.

My own very limited laboratory experience with the subject under discussion furnishes another striking illustration of the same thing. Some years ago I was interested in a research which involved shutting the subject of the experiment for an hour or more in an airtight box approximately 3 x 5 x 7 feet, thereby subjecting him to the effects of respired air. The percentage of CO_2 rose to 50 or more parts in 10,000. When the observer opened the door the odor of the air within was almost overpowering; and yet, provided the water vapor was absorbed and the temperature of the box kept down, the subject of the experiment had not only been unconscious of this odor but had actually suffered no discomfort. It can hardly be doubted that if he had been conscious of it, he would not only have been very uncomfortable but could not have done the mental work which, as it was, he performed easily in many of the experiments. The substances producing the odor had accumulated so gradually and been so evenly distributed throughout the closed space that there was no adequate stimulus to the sense of smell; yet

* Read before the American Public Health Association, at Richmond, October, 1909.

they were there and should have excited any toxic action of which they were capable.

But granting all this, we have, of course, no argument against the hygienic importance of ventilation. It is the province of hygiene to secure and maintain the highest possible working efficiency of the individual, and we cannot doubt that, whatever the explanation or the mode of action, the air of a crowded, unventilated room is unfavorable to the highest working efficiency. We have here to try to answer the question, why is this air harmful?

The history of the subject shows clearly that the problem is not so simple as is often supposed. No doubt you are all familiar with the fact that the first attempt at explanation—that there is a deficiency of oxygen or an excess of carbon-dioxide in the air breathed—failed with the proof that in neither of these respects does the air of very badly ventilated rooms depart sufficiently from the normal to cause any physiological disturbance.* The settlement of this question cleared the ground for the search for the true cause, which was very properly supposed, as a provisional hypothesis, to be some abnormal constituent of the atmosphere, other than carbon-dioxide. The odor of the air proves the presence of abnormal constituents and its disagreeable character certainly suggests, although it by no means proves, that they may be harmful. One of the earliest experiments bearing on the subject we owe to Brown-Sequard. Air was aspirated through a series of bottles in each of which was placed a mouse. Between the fourth and fifth bottles the air was passed through strong sulphuric acid. Brown-Sequard reports that the first mouse to die was that in the third bottle while the mouse in the fifth survived without ill effects. It was plausibly assumed that the acid had removed some poisonous material other than carbon dioxide. The repetition of this experiment in the hands of competent observers has at times

* It should, however, be remembered that this is not the same thing as saying that oxygen deficiency or carbon dioxide excess has nothing to do with the ill effects, for the important thing is not the tension of these gases in the room, but in the lungs from which they are absorbed into the blood. It is conceivable that the consciousness of unpleasant odors, or other causes, may lead to more shallow breathing, this diminishing the volume of air breathed into the alvioli of the lungs and so cause lowered tension of oxygen and increased tension of carbon dioxide in the lungs despite the approximately normal content of these gases in the air of the room. Haldane and Smith have given us a simple method of determining the composition of the air within the lungs and it is desirable that this question be put to the test of investigation.

given similar results to those of Brown-Sequard and at other times given divergent results. Possibly this is to be explained by the differences in the rate at which the air is aspirated through the bottles or by some other uncontrolled condition of the experiment. It can hardly be doubted that, under the given conditions, toxic substances are added to the air; and, since these are removed by sulphuric acid, it is possible that they are of basic nature.

The presence of toxic constituents in the air of a crowded room is also indicated by experiments in which the water vapor of the air is condensed by cold and the liquid thus obtained is administered to an animal in one way or another. While the methods of work are decidedly open to criticism, it would seem that in many of them distinctly toxic and even fatal results have followed. In other experiments large quantities of the air of the room have been passed through sulphuric acid, the acid subsequently neutralized, and the liquid thus obtained has proved to have toxic properties.

Assuming that the positive results from experiments of this kind should be given greater weight than negative results, we are still justified in concluding only that the air of the crowded room contains some poisonous material. We are not justified in assuming that it comes from the lungs, since there is obviously the possibility of contamination from the skin, clothing, decaying food particles in the mouth, or catarrhal exudates from the air passages, and the like. This has an obvious practical bearing on the older teaching, that while the carbon dioxide is not of itself poisonous, it indicates the quantity of poisonous material present. This cannot be true unless the poisonous material comes from the lungs; and there seems to be practical agreement that, when the respired air is received directly from the trachea of a normal animal, it is not only itself odorless, but there is no odor in the liquid obtained when the tracheal air is condensed by cold; nor do any toxic effects follow the administration of this condensed liquid to an animal.

As to what these toxic substances are we can only cite the experiments of Formanek, who detected in the air of a cage in which an animal was confined, ammonia or ammoniacal compounds. These were not found, however, when the cage was

kept scrupulously clean. The same observer reports that the administration of small doses of ammonium salts produces the same poisonous effects as the air of an uncleaned cage. We may conclude that if there actually is a poison in the air of a crowded room, it does not come from the lungs but from the skin, mouth, clothing, etc. It is also doubtful whether toxic material is regularly present. While this material may and probably does exert a toxic influence on those regularly living in poorly ventilated rooms, it does not seem to offer an adequate explanation of the symptoms which develop within half an hour after entrance into the room. At the utmost the unpleasant odor of some of them may influence the working power by unpleasantly affecting consciousness; but there is no proof that the material giving rise to this odor exerts any *rapid* toxic influence, or even interferes with working power, so long as the subject is unaware of its presence.

In studying the physiological aspects of ventilation, it is of practical importance to distinguish between what may be called the acute effects of exposure of an hour or so to vitiated air, and those effects which are produced by prolonged exposure to such air. While the line cannot be sharply drawn between them, still it would seem that the toxic material acting for long periods of time should produce a cumulative undermining of health quite different from the immediate acute interference with the running of the human mechanism which all have experienced after half an hour's stay in a crowded room. I wish to suggest that the toxic material, so far as it is a factor, does harm chiefly if not entirely when it acts over comparatively long periods, and that we must seek elsewhere the explanation of the acute effects. They are sufficiently familiar to all; the dull heavy feeling; at times headache; the difficulty of sustaining attention, or even of keeping awake while listening to an address. Restlessness also develops, and this is often the expression of actual discomfort.

The symptoms are strikingly similar to those experienced in the warm muggy days of summer time, and in two respects the atmospheric conditions in the two cases are the same; namely, the high temperature and the high degree of humidity. Every breath of expired air leaves the nostrils at almost the temperature of the body, and saturated with aqueous vapor. The

result is the most unfavorable of conditions for the maintenance of the constant temperature of the body, in the effort to maintain which resort is had to vascular and other adjustments, which, while successful in their immediate object, are unfavorable for other physiological activities. So important is this maintenance of the constant temperature that almost everything else, such as digestion, mental work, and the like is sacrificed to it.

A constant temperature means, of course, the maintenance of equality between the heat production and the heat output of the body. Heat production, when the body is not engaged in muscular activity, is, to all intents and purposes, constant above 68 or 70 degrees F. At these temperatures it does not vary with external climatic conditions, and is not influenced by ventilation. The method of heat output, on the other hand, does vary with atmospheric conditions, and may be profoundly influenced by ventilation. It is so important to have this point clearly understood that, even at the risk of becoming tedious, I shall take the time to review the essential features of the physiology of heat output.

Heat is lost from the body chiefly in two ways. The first we may conveniently term *heat transfer*, and it includes the loss by radiation, conduction and convection; the heat thus lost is transferred to other objects the temperature of which is thereby raised. The second is by the *evaporation* of water, and in the body chiefly by the evaporation of the water of perspiration. The loss by heat transfer varies with the difference of temperature between the body and surrounding objects. Hence, the rate of heat transfer decreases as the external temperature approaches that of the body, which latter would rise as the atmospheric temperature goes above 70°, were not perspiration then secreted. So long as this perspiration can evaporate readily, there is little difficulty in keeping output equal to production. When, however, owing to high humidity evaporation is lessened, blood is rushed in larger quantities to the skin *at the expense of the flow to other organs;* the temperature of the skin is raised and so heat transfer by radiation, conduction and convection is facilitated. The normal temperature of the body is approximately maintained; but it is at the expense of the working efficiency of other organs and especially that of the brain.

Between the circulation in the skin and that in the brain there is a very close correlation; one is generally, if not always, secured at the expense of the other. Thus sleep is accompanied by increased cutaneous circulation; waking is preceded by a sudden, marked cutaneous constriction. Mental work, especially that involving interest and attention, is accompanied by still further limitation of the flow of blood to the skin. Conversely, whenever the cutaneous vessels are made to dilate, as on the warm, muggy day, the quantity of blood flowing through the brain is lessened. In these facts we probably find the true explanation of the dull heavy feeling, the difficulty of attention, and the discomfort both of the muggy summer day and of the crowded ill-ventilated room. It is not impossible, too, that the unfavorable circulatory conditions in other organs as well as the disagreeable sensation of an overheated skin contribute to the interference with working power.

I would, therefore, conclude that the most important if not the sole cause of the acute effects of poor ventilation is the combination of high temperature and high humidity which then obtains. It is neither of these acting alone but *the two working together* which introduce into the system the unfavorable circulatory conditions we have described. It remains for us to consider in this connection a feature of the relation of high humidity to heat output, which has a very important bearing on the practical problem of ventilation.

Humidity influences the output of heat from the body in two very different ways: It increases the conductivity of the atmosphere for heat—a cooling influence; and it interferes with the evaporation of perspiration—a heating influence. What the net result will be depends on which of these influences of humidity is predominant. Below 70° the second, or heating, effect drops out, because so little perspiration is then secreted, and a high degree of moisture chills the skin, as shown by the familiar effect of an east wind in winter along our northern Atlantic coast. Above 70°, on the other hand, because conduction is slower, it becomes necessary to evaporate perspiration and at these temperatures humidity heats the skin. Between these lower and higher ranges of temperature, there is a neutral

region at which high humidity has comparatively little effect. This region is about 68° or 70°. We have only to appeal to our own experience to see that high humidity chills the body at 65°, while it is hardly noticeable (in the absence of muscular activity) at 70°. In other words, so long as the temperature of a crowded room is kept at 68° or 70°, it makes little difference whether the humidity is high or low, so long as the occupants of the room are sitting still.

It follows from this that one of the most important, indeed, we may almost say, an absolutely essential object of ventilation is that of maintaining the optimum room temperature of 68° to 70° F., and fortunately the temperature of a room, except in warm weather is more readily controlled than the humidity. If the air is too dry, it is a simple matter to raise its content of water vapor to the normal—and this should always be attended to. If, on the other hand, there is an excessive quantity of aqueous vapor in the room, there is no economical way of removing it, the least expensive probably being that of introducing very large quantities of dry air. If, however, the temperature be kept down to 68°, high humidity may be largely neglected. I may here quote the actual experience of a friend of mine who had to secure good ventilation in a crowded lecture hall. He found that so long as enough cold air was pumped into the room to maintain the atmospheric temperature of 68° or 70°, everyone in the room was satisfied with the ventilation, while complaints would come in as soon as the room temperature rose above 70°. The quantity of air supplied was the same in the two cases; presumably the quantity of "poisonous exhalations" from the bodies of those composing the audience was also the same; and yet two or three degrees of temperature made all the difference to these people between good and bad ventilation.

When the room temperature cannot be kept down to the proper point by the introduction of cool air, fairly vigorous air currents must be maintained over the bodies of the occupants of the room. It is a matter of common experience that artificial systems of ventilation very frequently fail in warm weather, and the physiology of this is quite clear, for under these conditions ventilation must facilitate heat loss by favoring convection and

evaporation. The "aerial blanket" of stagnant air must be removed; and the very virtue of not creating a draught when cold air is introduced becomes the fatal weakness of the ventilating system when we can introduce only air of a higher temperature than 70°. The practical problem is an engineering one; but the conditions to be satisfied are perfectly clear.

SUMMARY.

In this paper I have dealt only with the question of the deleterious conditions introduced into a room by the presence of human beings in it. It goes without saying that deleterious conditions may be introduced in other ways—from leaky gas fixtures, by the updraft from damp cellars, and so on. A large room which has been closed but not occupied may and generally does require the introduction of fresh air before it presents ideal climatic conditions for even a single occupant. Hence the ever present need of the renewal of fresh air from without.

Within the limitations of our subject, I have tried to draw the distinction between the immediate or acute effects of poor ventilation and the more or less probable remote effects upon those staying for any length of time in rooms where the air is not renewed as it should be. I have shown that attempts to trace the *acute* effects of poor ventilation to the presence of toxic substances given off from the bodies of the occupants of the room have thus far been unsuccessful, although it does seem that prolonged exposure to some of these substances, especially ammonia compounds, may be responsible for the results of regular and prolonged exposure to vitiated air.

Whatever may be the actual role played by these emanations from the body, two other factors—one physiological and the other psychological—are of prime importance. These are the increase of temperature and humidity in the room, and the disagreeable sensation from unpleasant odors or from an overheated skin. The combination of high temperature and high humidity acts by rendering the output of heat more difficult; and the effect on the part of the body to maintain its constant temperature under these conditions introduces vascular and other conditions unfavorable to the efficient circulation of blood

through the brain and other organs. The psychological condition of uncomfortable sensations may act purely as a psychological factor, but it may also, like so many feelings or emotions, react on physiological processes and so lower the standard of working power.

Finally, while the introduction of fresh air is of great importance, indeed is essential, we should remember that equally important is the maintenance of the ideal room temperature of 68° to 70°, since at this temperature the humidity factor is almost negligible.

Section of Municipal Health Officers

INCINERATION OF CITY WASTES WITH UTILIZATION.*

By Dr. P. M. HALL,
Commissioner of Health, Minneapolis, Minn.

The methods for the disposal of city waste have gone through the various stages of dumping, both upon land and sea, pig-feeding, reduction and incineration. With all of these various methods the primary object sought was the getting rid of the natural accumulations incident to life in cities. The question of whether the disposal was sanitary or not was not thought of or at least, was a secondary consideration. Later, the question of sanitary handling has been thoroughly gone into, from the proper construction of the receptacle, to the final disposal. The care of the can and its contents; the vehicle in which the waste material is carried, and every step of the operation has been gone into to the minutest detail. The question of SANITARY disposal may be said to have been finally reached—methods varying only in different cities depending upon the kind and construction of the machinery for final disposal.

Much might be said in the mere recital of the kind and character of the receptacle—how it should be kept to prevent it from getting foul, to protect it against the dangers of fly infection, and gradually, in a general way, educate the householder to habits of cleanliness. The most fascinating side of this great question at the present time, however, is that which concerns the recovery of valuable by-products, or some means of utilizing the various component parts of the city's waste, that the cost of final disposal may be reduced or be made profitable. The mere question of disposal may be considered as settled.

In our own city we have been working for the past two years with this question of utilization, and I have thought that a brief recital of our progress might be of some general interest.

* Read before the Section of Municipal Health Officers of the American Public Health Association, at Richmond, Va., October, 1909.

After experiencing two fires, when the plant came up for reconstruction the second time, we first took up the proposition of preparing to utilize the heat generated in the burning of garbage and rubbish, in the development of electric current and the production of steam for heating and power purposes. By way of explanation I might say that we have the two-barrel system of collection. One can serves as a receptacle for garbage and combustible rubbish, and the other for ashes and such rubbish as will not burn. The two cans thus take care of all the waste material of the average household. We have insisted that all garbage be thoroughly drained of moisture and wrapped in paper, to do away with fly infection. In this way, the garbage and rubbish are collected comparatively dry.

Our old plant was composed of two units or incinerators placed side by side, each connecting with a common stack. In the resetting of the plant, a water-tube boiler of 150 H. P. capacity was placed between the two incinerators, and the hot gases arising from the burning garbage and rubbish were allowed to pass through this boiler on their way to the stack. To get additional draft an induced draft fan was placed at the base of the stack, and later this was supplemented by a forced draft fan under the grates. The first noticeable result following this installation was the increased burning capacity of each incinerator. Where formerly the maximum capacity of each incinerator was 50 tons of mixed garbage and rubbish in 24 hours, we are now able to burn as high as 150 tons in one incinerator in 24 hours. Each of the incinerators is water-jacketed on five sides. This enables us to use the incinerators as feed-water heaters for the water-tube boiler. Thus it is possible to evaporate a large amount of water, as all water entering the water-tube boiler coming from the incinerators under a pressure of 45 pounds is above the boiling point when fed into the boiler. Our first test of one incinerator working in conjunction with the boiler gave us 429 engine H. P.

In January of 1908, we installed an electric generator and began lighting all the work-house buildings, the Superintendent's residence, two green-houses, and the tuberculosis hospital. This brought about a saving of $2400.00 for light in the eleven months of that year. This was done without adding a dollar of expense to the previous cost of disposal.

In the latter part of November of the same year we began to furnish the steam necessary for heating all of these buildings, for heating all the hot water which was necessary, the steam for cooking and laundry purposes, and for the operation of the steam sterilizer at the tuberculosis hospital. The plan adopted was the gravity system, steam being furnished at 40 pounds pressure. This service of steam, heat and power saved the city $1000.00 so that the combined service of lighting and heating together with the other uses to which the steam was put, saved the city $3400.00 in round numbers for the year.

The service of heat through the winter added a little to the cost of fuel at the Crematory Plant, owing to the fact that the supply of garbage fell short of running one incinerator at its maximum capacity, and also on account of the fact that on Sundays and holidays it was necessary to furnish the service. This service of heat and light has been carefully recorded by proper meters, and for this year will save the city between $7,000 and $8,000.00.

In the operation of the plant we have learned some things which may be of value to others studying the same problem. We found, first of all, that we could easily operate a much larger boiler, and that to properly take care of this heat to best advantage, the type of boiler selected should be such that will permit of easy cleaning, as with a strong draft a great deal of light material is carried over into the boiler tubes.

Another point learned is that sufficient by-passes should be constructed so that each of the incinerators and the boiler itself can be operated independently of each other, or all together as the minimum or maximum demands of the plant require. There should be some provision made for the storage of material used for furnishing the fuel. This has been easily met in our case by utilizing our steel garbage boxes for storage purposes. All of our garbage is collected in steel tanks, hauled to a central transfer station, transferred to flat cars by electric hoist, and thence to the Crematory. At the Crematory Plant these steel tanks are lifted from the cars by electric hoist and dumped directly into the incinerators through an overhead hopper. It has thus been easy to use these tanks for storage purposes, dumping them at such times as they were needed.

We are at the present time installing a new boiler of about three times the capacity of the old one, together with a larger fan, larger stack, etc. We expect through this plant to furnish light and heat to a new addition to the tuberculosis hospital, a new cell-block of the work-house, a new hospital for contagious diseases, and hospital for incurables, which are to be installed during the coming year. Over and above the needs of these buildings, we will have sufficient steam to develop electric current for lighting the streets of four of the wards of the city—about 500 arc lights in all.

With the completion of the full plan of utilization, we will be able to dispose of our garbage for nothing and save the city in heat and light between $30,000 and $40,000 per annum. There is no question but that with proper facilities for the utilization of the developed steam, an incineration plant can be made to pay its own way.

DISPOSAL OF CITY WASTES AND CONSIDERATION OF NUISANCES IN EDMONTON, ALBERTA, CANADA.*

By T. H. WHITELAW, B. A., M. B.,
Medical Health Officer, Edmonton, Alta.

The disposal and destruction of garbage in Edmonton presents some difficulties, which will not be met with in the older Provinces and which add greatly to the expense of the scavenging department of our City. The soil surrounding Edmonton is so rich and apparently so inexhaustible that manure has no commercial value. Hence the necessity arises of destroying almost the entire product of stables, public and private. Previous to August, 1908, all garbage, refuse, dead animals and manure, were deposited in the nuisance ground and afterwards burned in the open. This process was necessarily slow and the whole neighborhood continually reeked with the fumes and smoke resulting.

Night soil was deposited in pits,,which when full were covwith a large heap of manure, the reduction of which to ashes afterwards by burning, was supposed to effectually cover and render innocuous the contents thereof. Owing to the rapid growth of our city, this nuisance ground eventually became the center of an inhabited district and it became necessary to adopt some method of destruction which would not be an offence to the citizens in the neighborhood. Consequently in August, 1908, the Decarie Incinerator purchased by the city began operations on the site of this nuisance ground. This incinerator had a capacity of 50 tons per day and cost $41,857.66.

We have this year added an induced draft fan to the plant which will if necessary increase its capacity to 75 tons per day.

Though the plant was not primarily intended as a manure destructor, it has, on account of the impossibility of disposing of this product in any other way, been used for the disposal of this material, as well as for all kinds of garbage, refuse and dead animals. Of the material destroyed which is about 50 tons per day on the

* Read before the Section of Municipal Health Officers of the American Public Health Association, at Richmond, Va., October, 1909.

average, about 90% is manure, and it requires a staff of one engineer and five workmen to man it, two of these being engaged on a night shift. The wages of these men together with wood, coal, repairs, light and telephone comes to about $500.00 per month and thus the actual cost of destroying all material is about 42 cents per ton as an average.

If, however, the manure had a commercial value as a fertilizer, as would be the case in eastern cities, one workman together with the Engineer would be ample, and an Incinerator of this capacity would be sufficient for a city of at least 50,000 population, or about double the present population of Edmonton, and would destroy all ordinary household garbage, dead animals, and offal from slaughter houses in an efficient manner. While this incinerator at present does destroy a portion of our night soil from a few pit closets, which unfortunately cannot be dispensed with, our experience does not lead us to recommend this method of destroying such material in a city where a system of sewers is laid down. We are rapidly extending our sewerage system and endeavoring to keep pace with our rapidly growing city and it is our intention to deposit all night soil and liquid garbage in manholes suitably placed over our trunk sewers, as the most satisfactory way of dealing with this difficulty.

Our scavenging at present is let by contract each year, which includes all household garbage and refuse, ashes and night soil, but manure, trade refuse, offal from slaughter houses, and garbage from boarding houses are not removed at the public expense. It is our intention to have, if possible, the scavenging done by the city in future instead of letting the work to contractors. Under the proper supervision of the Health Department which would have absolute control, it appears to me much more efficient service would be given the citizens at little if any increase of cost.

All garbage and combustible waste is burned in the incinerator.

Tin cans and other non-combustible material are deposited at present in a ravine near the incinerator. This accumulation of tinware is becoming so vast that some method of turning this material to commercial use may well be considered in the near future.

Ashes are collected and used for filling up low places and for surface covering in the lanes of our city. When worked in with the heavy black soil they make a very excellent road surface. Some difficulty is found in enforcing the By-law which requires all householders to keep their ashes in cans reserved for ashes only. Tin cans and broken glass are often carelessly thrown in with the ashes.

Night soil from pit closets and sanitary pails is deposited in the man-hole over a trunk sewer. In winter time thawing out of the sanitary pails, by boiling water, becomes necessary before they can be emptied. The system of sanitary pails adopted by our city some years ago, does not commend itself to me. It is expensive in operation, unsightly, unsanitary and from the general tendency for closets to get into a chronic state of disrepair, free access to the contents of the pails is afforded flies during the summer months. The great majority of cases of typhoid developing in our city, which fortunately are comparatively few in number, are derived from the areas where privies are still in use. Where it is impossible to obtain water and sewer connection it appears to me that well constructed brick and cement pits would be preferable to our sanitary pails.

A peculiar situation exists in our city due to the large number of tents used as dwellings both winter and summer. The rapid increase in our population and the scarcity of houses, some years ago, with high rents prevailing caused a great many to adopt tent life. Owing to the dryness of our atmosphere in winter and the absence of winds, thaws, blizzards or rains, these occupants of tents have found that a fair degree of comfort can be obtained in a well constructed tent with a wooden floor. By banking up with snow or earth to the level of the floor and having a suitable stove, which the abundance of cheap fuel makes it possible to keep going continuously, a tenter is enabled to defy even the coldest extremes we have here, even better than those who live in badly constructed houses. Consequently, a great many of those who began to live in tents as a temporary expedient, have continued to use them from economical motives, and thus a condition eventually came about, which compelled us to take some action to exclude tents from the best residential areas supplied with water and sewer services. The residents of these areas

naturally object to tents being located on vacant lots adjoining, their occupants usually paying a nominal ground rent of $1.00 per month or being merely squatters paying nothing. No sewer or water service being possible in a tent, privies and garbage heaps on which slop water is thrown are the inevitable adjuncts to a tent used as a residence.

The tent By-law was amended therefore, making it compulsory for tenters to remove their canvas roofed dwellings to the outlying parts of the city where water and sewer mains had not yet been established. The majority of them have complied but a small minority have, with obstinate pertinacity, refused and owing to legal technicalities and quibbles which are raised by the lawyers whom these tenters employ to defend them, it has been found a very difficult matter to enforce the By-law. The Police Magistrate would not accept as conclusive evidence, the plans of the City Engineer showing water and sewer mains laid, but asked me to prove that water was flowing in the pipes and that the sewers were in use. This I succeeded in doing by bringing in as witnesses, the residents of neighboring houses to testify that they were using water and sewer services. The next difficulty was to prove that the dwelling was a tent and not a building, and in one instance the Magistrate decided that there was sufficient lumber about the structure though it was outwardly a tent, to justify him in calling it something not a tent, and in giving a verdict against us. The defendant in this case is a wealthy man and owns a large house from which he is drawing rental.

We expect shortly to have a new Health By-law put into force which will eliminate all the defects of our old fragmentary By-law and give us power to strictly enforce the regulations governing compulsory water and sewer services. A license fee of $2.00 per year is now imposed as a tent license and, as a result of more stringent regulations which we have lately attempted to enforce, a marked diminution in the number of tent dwellers has been brought about. We have now only about 250 tent dwellings in the city, while some two years ago it was estimated that at least five thousand citizens lived in tents.

THE SCHOOL NURSE AS AN AID TO MEDICAL INSPECTION OF SCHOOLS.*

By GUY L. KIEFER, M. D.,
Health Officer, Detroit, Mich.

The medical inspection of school children was begun in this country, in a systematic way, about seventeen years ago. Boston was the first city to establish such a system and it proved so advantageous that many others soon followed. The plan of the work has been similar in the various cities and the development of the system has, in nearly all instances, been almost identical. Usually the first thing undertaken has been a daily examination of the school children who have been absent for one or more days, for the purpose of ascertaining whether they were suffering from some contagious disease which had remained unrecognized. Whenever such pupils were discovered they were excluded from school and upon their return, re-examined, to make sure that they had recovered, from the given disease. The next step in the development of medical school inspection has invariably been the examination of children for physical defects and then, as the work was further enlarged upon and improved, visiting nurses have been added to aid the examining physician in his labors.

It would seem that, inasmuch as this has been the history of medical school inspection, wherever it has been undertaken, the reasons for these various steps in its evolution must be the same in each case. The experience of the various cities, I will assume then, has been similar to ours in Detroit, namely, about as follows: After a corps of physicians had been at work for a time long enough to allow me to analyze the results obtained, I found that a majority of the cases of the milder contagious diseases such as tonsillitis, mumps and chicken-pox and even of the severer infections as for example, diphtheria, scarlet fever and measles, were in children having the more common physical defects, such as

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adenoids, enlarged tonsils, etc. The natural conclusion was that a better method of prevention would be to remove the cause; in other words, to make an effort to remedy the physical defects. The next thing that became apparent in this work was that children who had been excluded for various of the contagious skin eruptions—scabies, impetigo, and ringworm, and even those excluded on account of pediculosis, would not return and consequently, on account of the neglect or carelessness of shiftless parents, were deprived of weeks and often months of schooling to which they were justly entitled.

It was also noticed that only a small percentage of the parents, to whom cards were sent calling attention to a physical defect in the child and recommending its correction or removal, paid any attention whatever to this kindly and timely advice and the work of examination and recommendation had been done in vain. The solution of the problem seemed to present itself in the employment of a trained nurse for the purpose of "following up" these various cases. The experiment was tried in Detroit several years ago when the Visiting Nurse Association of that city furnished the Board of Health with a nurse for this purpose. It is the duty of this nurse to visit the homes of children who have been excluded from school for contagious diseases to see that they have proper attention. When medical attention is required she prevails on parents to call in their family physician, or, in case they are too poor to pay for the services of a physician, she sees that the city physician is summoned. In minor contagious conditions, such as pediculosis and the like she shows the mother how to clean the child's head and, in many cases, she actually does the cleaning herself. When the child has been examined as to its physical condition and a card sent home recommending the correction of some physical defect, the nurse sees that, if possible, proper attention is given the child. It is cared for either by the family's physician or at a free dispensary, to which latter the nurse in many cases takes the child.

Besides all this, the nurse conducts what might be called a clinic, in each school at which she attends. At this clinic the nurse attends to such minor defects and ailments as may be corrected without sending the child to its home. The results obtained after a year's experiment were so satisfactory that the Board of Health asked for an appropriation sufficient for the

employment of four nurses. Two nurses were granted last year and an additional one this year so that now we have on our staff three school nurses. Each of these attends four schools daily and makes such other calls as her time will allow. During the past school year the two nurses made 1169 visits to the schools and 2723 visits to the homes of pupils. They gave personal attention and such treatment as was possible at the school clinic in 4651 different instances and personally took 158 children to free clinics for treatment. Besides this the nurses personally cleaned 46 heads in homes where the mothers were either too careless or too ignorant to administer this necessary treatment. Of the visits made to the homes of the pupils, 2262 were made because pupils had been excluded for contagious diseases and 461 because the correction of physical defects had been recommended. Of the 461 cases of physical defects, 289, or a little over 60 per cent were corrected. Of these, 152 suffered from defective eyesight and 76 received attention, the large majority of them being provided with glasses, 79 had diseases of the eye not due to defective vision but mostly conjunctivitis and all of these received treatment and were relieved. There were 28 cases of diseases of the ear, 16 of which received medical attention; 12 cases of defective hearing all of which were improved; 82 cases of adenoids, 50 of which were operated upon; 66 cases of enlarged tonsils, 25 of which were corrected; 36 cases of defective teeth, 27 of which were attended to; and six of phimosis, 4 of which were relieved by operations. It was found during the same year that of the cases of physical defects not followed up by nurses only about 20 per cent received attention.

Let us consider also the fact that the nurse during her visits to these homes is an instructor in hygiene. She teaches the mother and children something of personal cleanliness, care of the home, ventilation, etc., which they have never known and in this way disseminates knowledge of the prevention of diseases which is of inestimable benefit.

It is generally conceded by all practical sanitarians that a system of medical inspection of school children is an important factor in public health work and is of much service in limiting the spread of contagious diseases, but, in my judgment, the work of such medical inspection is only half done without the aid of the nurse.

REPORT OF COMMITTEE ON FOODS.*

No attempt has been made by your committee in its investigation to cover a wide range of territory, neither has there been an effort to include every subject which might be considered. Through the secretary, your committee was directed to report upon foods, and to give especial attention to the subjects of milk and water. In consequence of this injunction, it was deemed advisable to restrict the inquiry in an endeavor to gain a useful insight into the progress indicated along limited lines and in a fairly representative sense from the geographical standpoint.

PROTECTION OF FOOD STUFFS.

An energetic attempt is being made in many cities in this country to protect food stuffs, not commonly cooked before being eaten, from contact with dust and contamination by flies. The regulation in force in Washington, D. C., extends to dust and insects, and requires the wrapping or covering in a cleanly manner of all foods not commonly washed, peeled, shelled or cooked during sale or transportation. Foods and beverages in stores and restaurants are also required to be screened or protected by power-driven fans from flies and other insects. Boston's regulation, in addition to providing against corruption of foods by dust and insects, further prohibits contact with animals. The regulation of this last named city also aims to protect a wide variety of foods, such as meat, poultry, game, fish and sea food.

In Chicago, in addition to the efforts of the authorities to have food stuffs screened against flies, the public has been urged not to purchase foods which may have been contaminated through contact with flies.

An endeavor was also made to prevent this contamination of food stuffs in Indianapolis, Ind., Cleveland, Ohio, New Haven, Conn., and in some Massachusetts cities. In the first named city after a legal contest, the regulation was declared valid. The board of health of New Bedford, Mass., has a regulation of this nature under consideration. Washington, D. C., also has a pro-

*Read before the Municipal Health Officers' Section of the American Public Health Association, at Richmond, Va., October, 1909.

vision in its health rules, which is unique as far as the investigation of the committee goes, in that there is a prohibition against the exposure for sale between April 1 and October 1, inclusive, of any fresh meat or fresh fish, unless the same be kept at a temperature not exceeding 55° Fahrenheit.

This oversight concerning foods also extends in several cities to the condition of premises. In Washington, D. C., the authorities require the registration of managers of stores and restaurants where foods or beverages are manufactured, stored, or kept for sale. This is to facilitate systematic inspection, and the places regulated are arranged in routes, so that an inspector can conveniently examine the establishments within a given locality. A score card is used in connection with this work, and the finding of objectionable conditions is followed by proper action. The health department of Indianapolis, Ind., also uses a score card in this control of establishments serving the public with food stuffs.

Winnipeg, Man,. is another city in which a vigorous attempt is being made to protect all food supplies by requirements of great cleanliness during the various stages of manufacture, storage, and sale.

Boston insists on cleanliness in all establishments and appurtenances where food supplied the public is handled, and this provision extends to covers and screens on peddlers' carts, and the latter must be provided with a suitable receptacle for food wastes.

Salem, Mass., endeavors to ensure cleanliness of utensils, receptacles, and wagons used in the sale of ice cream.

Your committee believes these regulations, which aim to prevent contamination of foods by dust and other means, timely, and worthy of serious consideration where such ordinances have not yet been adopted. Especial emphasis should be paid to the better protection of foods like bread, cake, crackers, etc., from dust and dirt and contact with the hands and clothing of human beings.

WATER SUPPLIES.

The influence of the water supply upon health may be best learned by the experience of cities that have provided for the filtered or protected water supply during the last decade, and the

influence that the protection of the water has had upon the occurrence of deaths from typhoid. It was typhoid fever that induced the voting of money for the improvement of water supplies. The experience of several cities in New York State since 1900 is of interest. Niagara Falls, with a typhoid mortality rate of 114 to 184 per 100,000, with a gradual reduction of the rate to 87 after having partly filtered water, is now preparing to spend $350,000 to filter all of its water. Albany, with a former rate running to 87, is now maintaining a rate of minus 20, and sometimes as low as 10; the water has been filtered since 1897. Elmira, with a former rate of 33 to 80, having filtered water, now has a rate as low as 15. Binghamton has a reduced typhoid rate since she began to filter water, having in one year since beginning filtration attained a rate as low as 9. The most notable example in the above state is that of the City of New York, which is now spending $160,000,000.00 on the development and protection of a new supply of water. Practically all of the cities in New York State now have water that is properly filtered, or surface water entering large impounding reservoirs or upland streams with small reservoirs. The trend of engineering and public thought in this last named state is directed towards the adequate protection of supplies, and that not by extending intakes into lakes nor by inadequate sand filtration, but by that kind of protection that really protects, and that is by the best mechanical filtration possible.

Other large undertakings, which aim at the improvement of local water supplies, are those at Pittsburg, Pa., Milwaukee, Wisconsin, and of the Lake Michigan Water Commission. The members of this commission represent the cities of Chicago, Ill., Milwaukee, Wis., Grand Rapids, Mich., Hammond, Whiting, and East Chicago, Ind., and the States of Illinois, Wisconsin, and Indiana. The important and far-reaching inquiry in which this Commission is engaged will ultimately result in lessening the pollution of Lake Michigan, the water of which is used for domestic purposes by many cities and towns bordering upon the lake.

Milwaukee, Wis., is planning a new system of sewage disposal to obviate the necessity of discharging into the lake, and thereby overcome the present pollution of the city's water supply.

The boards of health of many municipalities have oversight of their water supplies through frequent chemical and bacteriologic examination, and are earnestly intent upon the problem of betterment of conditions. At Baltimore, Md., there was an attempt to install a filtration plant for improvement of the city water, which failed by reason of local county interests. Such an outcome is to be deplored. The question of the city well is one of great seriousness, and a determined attempt is being made in many localities to stamp out those wells which show evidence of pollution. At Washington, D. C., a few shallow wells are found, and these are being replaced as rapidly as possible by driven wells. Fifty-seven well and spring waters were examined at Cleveland, Ohio, in 1908; of this number 19 were condemned. Sixty-five per cent of the population at Indianapolis, Ind., use the municipal supply, the balance depending upon driven wells. Many of these are polluted, and are being closed as rapidly as practicable under the law. In Richmond, Va., the board of health is making a determined effort to close wells showing pollution. There are 5,000 wells in Milwaukee, Wis., 91% of which are contaminated. These are being filled and abolished by orders of the Health Department.

Some cities are endeavoring to regulate the sale of mineral waters. Two Massachusetts cities, Springfield and Lawrence, license dealers engaged in this traffic, and the Board of Health of the last named city prohibits the use of spring water containers for any other purpose. These bottled waters are subjected to frequent examination in many cities, and the recent experience at Washington, D. C., and Buffalo, N. Y., where an alleged spring water was found to contain B. coli, emphasizes the need of investigation. The above matters resulted in legal action, and in Washington a well was found to have been the source of the water in question.

Your committee believes that the pollution of large water supplies cannot be effectually checked by municipalities, and that the proper solution of this important question involves state control. Massachusetts is an example in point, the State Board of Health having complete charge of this subject. In that state water-borne typhoid has practically disappeared, and water supplies are adequately protected, and many cities have sewage

purification plants. The experience of Massachusetts is being duplicated in Vermont and in other states where, with protective legislation and ample funds, the control of this subject has been vested in state boards of health.

MILK.

There can be no doubt that the warfare against unclean milk is being followed by improved conditions, also a more intelligent understanding of the subject by laymen. But much remains to be done in the way of education of both producer and consumer. With this latter text in mind, the Health Department of Richmond, Va., has accomplished much in enlightening the public by issuing bulletins and circulars of information. This last named department has made successful use of the score card to the improvement of the nearby local supply. Score cards have been adopted in many other cities, and Indianapolis, Ind., Winnipeg, Man., and Chicago, Ill., report good results therefrom. The authorities in several cities destroy milk which fails to comply with certain requirements. Thus the Health Department at Baltimore spill milk, on arrival from the country, which has a specific gravity below 1.029 and a fat content of less than 3½%. In New York City and Cleveland, Ohio, a similar course is adopted with milk which has a high temperature. The water supplies of dairy farms forms a portion of this milk problem, which is destined to receive more attention in the future. The authorities at Winnipeg, Man., recently examined water from 85 dairies, and of this number 8 warranted condemnation. At Washington, D. C., water from wells on dairy farms is collected and examined chemically, and where possible bacteriologically. If found polluted, a new supply must be provided, otherwise there will be a revocation of the permit to send milk to the city, and if the farm is within the city limit, such neglect may result in prosecution.

The worst milk, from every standpoint, to be found in large cities, is usually that retailed at shops. The age of this store product combined with many and oftentimes careless handlings and unclean utensils, are the chief detriments to its quality. Despite this fact the bulk of the milk used by poor people is

supplied by shops. The problem of improving the quality of this shop milk at a minimum cost has caused the adoption of regulations in several cities requiring stores to sell bottled milk, the placing in containers to be done by milkmen. This method is in vogue in Chicago, Ill., Indianapolis, Ind., Springfield, Mass., Portland, Me., Cincinnati, Ohio, and the Board of Health of Boston, Mass., has recently decided in favor of bottled milk for stores. Approval of this plan, based on actual results, has been received from a majority of the above named cities.

A year of progress in the suppression of the tuberculous cow can be noted. At Winnipeg, Man., a beginning has been made in applying the tuberculin test to dairy herds, and this feature is made a prominent part of the work of dairy inspection in Washington, D. C., and the health authorities of Montclair, N. J., Chicago, New Orleans, and nine cities in Wisconsin, including Milwaukee, have adopted regulations aimed at these diseased animals. This latter city has been involved in a controversy, in which the legality of the law was an issue. Final adjudication of this point is still pending, but a preliminary victory has recently been won by the Health Department. Several states, particularly Wisconsin, have been engaged in conducting vigorous campaigns, but these efforts, to yield the best results, involve the education of the farmer, i. e., it must be plainly indicated to him that it is to his advantage financially to keep his herd free from tuberculous cows. In this manner the co-operation of dairymen may be secured.

In the oversight of milk supplies your committee is also of the opinion that control of the highest efficiency necessitates state intervention. It is impossible for all cities to inspect every milk farm. Milk produced under objectionable conditions is often handled at unclean creameries, and then after heating, finds its way as cream or milk to the city consumer. Such cream or milk, if excluded by the stringent regulations of one city, working independently, is likely to be immediately shipped to another city, or to some creamery, where it is made into butter or cheese. The best results cannot be attained by cities working independently; to obtain a satisfactory improvement necessitates state co-operation. It must also be borne in mind that too stringent regula-

tions on the part of large cities, in view of the present attitude of a vast majority of the purchasing public, would ultimately mean a milk famine.

Your committee further suggests that an attempt to unify the systems of inspection, as well as to provide a suitable method for the exchange of information, is worthy of consideration.

James O. Jordan, Chairman.
William De Lano.
George W. Goler.

THE CONTROL OF A LARGE MILK SUPPLY *

By W. A. EVANS, M. S. M. D., LL. D.,
Commissioner of Health, Chicago, Ill.

A city's infant mortality is said to be an index of its civilization. This is only approximately true. Several elements serve to disturb the accuracy of the maxim. Cities with a large Slavic population have a high infant mortality. A heavy Italian population increases the rate. A large Jewish population lowers it. So does a large native population. The temperature and humidity are modifying factors. The size of the place is of very great importance as is the age of the milk when it is sold. This is largely determined by whether the cow is in town or the milk is hauled in by wagon or by train. Milk supplies which are train hauled demand a standard of requirements far in excess of those required for town cow's milk or wagon hauled milk. Bad milk may do harm in one of several ways:

FIRST—By the development of alkaloidal substances, such as tyrotoxican—of minor importance.

SECOND—By milk intoxications from overfeeding of milk—of great importance.

THIRD—Through milk-borne bacteria and mild changes in the milk which transport them—of greatest importance.

The third head can be subdivided into groups ranking in the order named:

(1) Diarrhoea in infants. (2) Typhoid. (3) Tuberculosis. (4) Scarlet fever. (5) Diphtheria. (6) Diseases due to other microbic life.

The Chicago milk supply consists of 30,060 8-gallon cans a day. This is produced on 12,000 farms and by 120,000 cows. 2,000 of these cows are in the city limits; of the remainder, 90% are within 50 miles of the city. Practically all of the milk is shipped in on the train (all but 1,000 cans). The great bulk of it is produced in Illinois; much of it in Wisconsin; considerable

* Read before the Section on Municipal Health Officers of the American Public Health Association, at Richmond, Va., October, 1909.

in Indiana, a little in Michigan and a very little in Iowa. We have not the simple proposition of a wagon-haul milk for a town of a hundred thousand inhabitants. We have 2¼ million people with many Slavic babies removed two days and many miles from the source of their milk supply. Of course, they should have fresh certified milk. Of course, they are not going to get it.

The methods for the control of milk are those usually in force in the large American cities. We have the usual corps of farm, platform and town inspectors. We score farms and dairies on the government score cards. Our laboratory examines the milk chemically and bacteriologically. Milk that is improperly produced we decline to allow to be sold in our market. The farmer can produce as he pleases or sell to any one else whom he pleases but not to us. The records are all public. The dealer can get the record of the farmer he is thinking of buying from; the farmer can get the record of the dealer to whom he is thinking of selling. We have a Milk Commission which certifies three farms. This milk runs less than 10,000 bacteria per C. C. It sells at 15 cents per quart. It sells satisfactorily among people of the better class. These babies do not need much or any help from the health department.

In spite of our inspection system our poor people get milk which has a high bacterial count. It is not iced. It is dirty. The babies which need clean milk most get it the least. We are confronted by a condition, not a theory—the high browed Academician who sits in his library and says give the babies of the poor certified milk is like Marie Antionette who said: "If the poor cannot get bread they should eat cake." The idea that a large American city with a train-hauled milk can get a milk supply with a low bacterial count at a low price is an idle dream. It is not subscribed to by the men who are in touch with the situation. Such a control would require one inspector to say every 50 farms—say a corps of 200 inspectors in and out of town for Chicago. American inspections are educational and persuasive. They are no where compelling or militant. They can not deliver a milk which will average safe for baby use.

Recognizing the very great difficulty in controlling cleanliness, insanitary conditions and communicable diseases in farms and farm households removed many miles from the city; recognizing

the wide spread distribution of tuberculosis among cows and men, and the wide spread distribution of typhoid among farmers and farms, the Chicago City Council in July 1908, passed an ordinance which became effective January 1, 1909. This ordinance provided that all cows supplying milk to Chicago must be free from tuberculosis by January 1st, 1914, that the test of tuberculosis for the purpose of this ordinance shall be a reaction to the tuberculin test; that during this interval all milk not from cows proven to be free from tuberculosis shall be pasteurized according to the rules and regulations of the Health Department.

The principles involved in these ordinances are as follows: The average profitable milk cow does not remain profitable for five years. A farmer having his cows tested and finding some tubercular can segregate the tubercular cows, keep his hogs away from them, send the milk to a pasteurizer and keep the tubercular cows until they are no longer profitable when they can be sent to inspected slaughtering establishments and sold for beef. By allowing the farmer five years to get rid of his tubercular stock you save him money loss; in fact, you make money for him, and you therefore expect his co-operation.

But, you ask, is it safe for the people? Will pasteurizing kill the harmful germs? The ordinances provide that the pasteurizing shall kill 99% of all the bacteria and all of those capable of producing disease. I now propose to tell you of how we have succeeded with these ordinances.

Of Chicago's 30,060 8-gallon cans of milk, 18,000 are pasteurized, 7,000 are from tuberculin tested cows, and 5,000 cans are not complying with the ordinance. The 7,000 cans of tuberculin tested milk comes from 30,000 tuberculosis-free cows. Nearly all of our milk supply from Indiana comes from cows which have been tuberculin tested; about one-third of that from Wisconsin is from tested cows; but little of that in Illinois is from tested cows.

The tuberculin testing has been a source of much fraud. Veterinarians have faked reports and farmers have immunized their cows preparatory to the test. In Indiana the work has been done by the State and it is averaged very satisfactory. In Wisconsin and Illinois it is promiscuously done and much incompetency and much fraud has been shown and some has

been proven. Tuberculin testing can never be satisfactorily controlled in a market such as ours except through state or national control of the testing and the testers.

The pasteurizing is done by 43 plants in town and 100 in the country. Some of the plants have done excellent work. Some are faking and some are incompetently run. Most of the faking is done by creameries and other butter plants. The holding pasteurizers are almost uniformly good; the flash pasteurizers are sometimes good and sometimes not. A flash pasteurizer which heats to 168 to 180 and which does not harm the cream or give a cooked taste will do satisfactory work 75% of the time. A pasteurizer which affects the cream line at 160° to 168° will not do effective work because the operator will not run it at a high enough temperature. Our best results have come from 140° to 145° for 20 minutes. But expensive holding devices, while giving excellent results, hardly seem necessary.

Milk run through a cheap pasteurizer at 150° and then run into ordinary cans will be 146° or over in 20 minutes. If, then, it is rapidly chilled, the bacteria are killed, the cream line is good, and there is no cooked taste. An ordinary holding vat of sanitary construction and heated before the milk is run in will serve the same purpose.

Pasteurizers can be controlled by bacteriologic examinations of the product at the plant and on the street; periodic inspection of the plant; automatic registering dials and heat cut-offs; regulation of the size of the tubes to and from the pasteurizers. Pasteurized milk may become infected subsequent to pasteurization, but the likelihood of such happening is less than the likelihood of infection on the farm. In our judgment the control of pasteurization will be the easiest control in connection with any part of milk production or marketing. Conclusions drawn from uncontrolled pasteurizations are not applicable to controlled pasteurization any more. I cite you some figures on milk taken at the machine:

Raw	Pasteurized	Bottle	Cooler
3,450,000	33,000		
4,400,000	less than 2,000		
30,700,000	less than 2,000	550,000	
3,900,000	20,000	65,000	
3,760,000	20,000		
3,390,000	20,000	80,000	
6,700,000	94,000	150,000	
9,300,000			178,000
18,250,000		28,000	30,000
25,700,000	150,000		
16,400,000	less than 2,000		
4,350,000	53,000		
6,400,000	28,000		

Since January 1st we have taken 5,661 samples of milk and ice cream for bacteriologic examination. About 200 of these have been injected into guinea pigs and the remainder have been examined or are being examined or have been lost.

Since July 1st we have taken 2,301. The great majority of these have been taken from stores, depots and wagons. A minority have been from hospitals, homes and other consumers. Many have been taken at the pasteurizing machine. Fifty were ice creams.

The following is an analysis of 764 samples taken since the latter part of July: Pasteurized, 230; raw 534. Average number of bacteria in the raw milks to the c. c., 7,348,828; average number of bacteria in the pasteurized milks per c. c., 941,445.

	Pasteurized	Raw
Under 1,000	2	0
1,000 to 10,000	7	0
10,000 to 100,000	86	12
100,000 to 500,000	68	50
500,000 to 1,000,000	26	39
1 million to 5 million	29	217
5 million to 10 million	4	103
10 million to 20 million	7	79
20 million and over	1	34

Using one million as the dividing point and saying that milk containing over one million germs to the c. c. should not be fed to babies and that milk having under one million can be so fed, we get: Pasteurized, 189 samples under one million; 41 over one million; raw milks, 101 under one million and 433 over.

In ice creams the maximum count was 125 million; the average was over 20 million; 8 had 30 million and over.

The minimum ice cream was 10,000; several were under 100,000 showing that it is possible to make good ice cream.

Not infrequently a milk which was good at the pasteurizer was spoiled by a dirty bottle, a dirty cap or dirty fingers in capping.

The maximum number of bacteria found in a supposedly sterile bottle was 24,000. A count of 800 was not unusual.

We have examined into the spoiling of milk, pasteurized and raw, stopped and open, chilled and at room temperature. The results of these studies are embodied in a paper which has been prepared by Dr. Tonney, Chief of the Chicago City Laboratory. We are of the following opinion:

First—When milk is a few hours old there comes a time when the bacterial counts do not increase, but slightly decrease. This lasts about two hours.

Second—Pasteurized milk develops as high a degree of acidity as raw milk in about half the instances, but it requires about two or three days longer to develop it (according to the temperature of the experiment and whether it is stopped or unstopped).

Third—After the bacterial count has reached 300 millions to 500 millions there is a decrease in bacterial counts. This does not come at counts below these figures, nor in acidities less than about 40 to 50.

All in all, we are sure that it is easier to control pasteurization than it is to control tuberculin testing, and certainly than to control 12,000 farms.

With us, these ordinances are not only getting us better milk but they are helping us to get the farms cleaned up. Sanitation, a bogy, a fad to the farmer, becomes something real when he sees an expensive plant for purifying milk. Its effect is just the same as the location of a large up-to-date milk plant in a country neighborhood. Every farm in reach of such a plant gets cleaner year by year.

We are sure that in optional tuberculin testing or pasteurization properly controlled we have found the proper solution of this vexed milk question, a solution which in time will be found acceptable alike to farmer, dealer, consumer and health official.

Section on Vital Statistics

THE RELATION OF PUBLIC WATER SUPPLIES TO GENERAL AND SPECIFIC MORTALITIES IN CITIES.*

By Dr. ARTHUR LEDERER.
Sewage Testing Station of the Sanitary District, Chicago, Ill.

It is not easy at the present state of our knowledge to improve by additional figures what has been proven during the last few years. It may be that in the near future when our death certificates become more reliable, and scientific investigations more successful, we will be able to tell to what extent the water supply is liable in the propagation of specific mortalities, excepting typhoid fever. Since we know in a general way that intestinal disorders are caused by polluted water, the introduction of a pure water supply must necessarily be followed by a reduction in the general mortality. To what extent this holds true must remain in many cases a matter of speculation, because there are so many other causes to consider besides water supply which aid in the spread of diarrheal diseases; consequently, I must confine myself mainly to a discussion of the relation of typhoid fever mortalities to water supplies, this being the only disease where thoroughly reliable statistics can be had.

In spite of the fact that the water supply is the foremost typhoid fever bacillus carrier, it is very often extremely difficult to get evidence of the pollution of the water, especially in smaller towns which have a surface water supply and no constant supervision. A subsequent examination of the water after an epidemic has set in is in a good many cases worthless. Very often we have to draw a conclusion, by excluding all other factors which may have been responsible.

Rather recent experiments have also shown that stagnant water is much more unfavorable to the existence of typhoid fever

* Read before the Joint Session of the Section on Vital Statistics and Section of Municipal Health Officers of the American Public Health Association, at Richmond, Va., October, 1909.

bacillus than is flowing water. The results of Jordan, Zeit and recently Houston from the Metropolitan Water Board of London, have demonstrated that through storage most typhoid fever bacilli will perish, but there is still a "resistant minority" which makes storage not an absolutely safe procedure. Sedimentation is the main factor in the elimination of the bacilli in rivers, as well as reservoirs.

A good many investigations have been carried on here and in foreign countries, showing the extent to which water supplies take a part in the epidemiology of typhoid fever.

A very complete statistical investigation on the cause of 638 typhoid fever epidemics and of twelve single cases for the years 1870 to 1899, has been carried on by Schueder in Germany. In his article published in 1901 (Zeitschrift für Hygiene, Vol. 38), he states that 77.4 of the epidemics could be traced to an infected water supply, 70.8% of which directly. It is equally important to learn the percentage of distribution of epidemics among the different supplies. James H. Fuertes, in his book, "Water and Public Health," classifies the various supplies according to their safety as follows:

1st. Mountain springs, flowing waters and pure ground-waters, with a typhoid fever mortality of 5 to 25 per 100,000 population.

2nd. Impounded waters, large normal rivers, great inland lakes, upland streams and small lakes, with limited water sheds which are more or less inhabited; the death rate will vary here from 15 to 55 per 100,000 population.

3d. Polluted waters (including rivers, public and private wells) showing a typhoid fever mortality ranging between 40 to 100 per 100,000 population.

It can be easily understood that there are many factors which, under otherwise like conditions, may cause considerable diversity of these figures.

In looking over the statistics of 248 registration cities for the period 1900 to 1907, I find that 51 have had a typhoid fever death rate exceeding 100 per 100,000 of population at one time or the other for the eight year period up to 1907.

Recently, the "Engineering News" in an editorial (61 p. 680) has given statistics for 48 New York cities, classifying them

according to the source of water supply and stating the range of a typhoid fever death rate for the nine year period, 1899 to 1907, inclusive. Eight cities using unfiltered river water have shown a variation of 23 to 133 deaths per 100,000 of population; unfiltered well water, five cities show a variation of 16 to 40; filtered river waters, seven cities show a variation of 22 to 72; well or spring water, 7 cities 20 to 52 deaths; streams and reservoirs, 14 cities, 15 to 49 deaths. The conclusion arrived at in the article is that the low death rate with unfiltered streams and reservoirs may be due to the duration of storage, a factor of greatest importance. Attention is also called to the marked effect upon the rate of small errors in vital statistics, which also is my personal experience; further to the varying efficiency of local boards of health and to the fact that other sources besides the water supply must be taken into consideration. It is easy to see why a deep ground water should furnish the best water supply. The natural filtration to which the ground water is subjected necessitates its purification to a degree that it reaches the surface nearly free from bacteria.

There has been a greater mortality from typhoid fever in the rural districts of the registration area than in the cities for the eight year period, 1900 to 1907. The cities showing a typhoid fever mortality of 24.3 per 100,000 of population, the rural districts one of 25.6. The shallow well, often within a short distance of an open privy vault, is surely one of the factors responsible. A good many sanitarians are not inclined at the present day to consider it the main factor.

As the density of our population increases, we are sometimes forced to abandon supplies which have been formerly considered safe, until today filtration is considered the only safeguard from infection with waterborn diseases. The vast majority of municipalities at the present is still using unfiltered surface and ground water, but the history of foreign water supply is sufficient proof that we cannot rely upon nature nor neighbor to safeguard water supplies, unless it be under extremely fortunate conditions.

In 1906 London's death rate was 6, and in 1907, 4 per 100,000 population. Stockholm has had a typhoid fever death rate of 24 for the first five year period beginning 1881, and 15 in the five year period, 1901 to 1905; the death rate was 3 and 2 in 1906 and

1907, respectively, per 100,000 of population. Brussels, Amsterdam, The Hague, Copenhagen, Christiania, Berlin, Breslau, Munich and Vienna show similar low figures. The highest death rate from typhoid fever of the 27 foreign cities mentioned in the 12th U. S. census is found in St. Petersburg, Rome, Milan, Toronto, Belfast, and even there the highest figures which we find for the periods up to 1890 are surpassed by the figures of a very large number of registration cities in the United States for the year 1907.

The reason for the low typhoid fever death rates in Western Europe is simply that surface waters are much more generally filtered than they are here. The laws and regulations, especially in Germany, protecting water supplies, and what is just as important, the enforcement of the laws, are very strict. Filters must show a certain efficiency required by state laws. Rigid sanitary supervision also extends to the milk supply. Oysters are not eaten so generally as here. Secondary causes, such as contagion and the infection from flies, are likewise decreased abroad. There must be, undoubtedly, a good many more factors which influence the mortality figures unfavorably than the water supply. Let us compare the typhoid fever mortality of some of our cities after a filter plant was established up to 1907, with the rate of the 27 foreign cities given the 12th U. S. census for the periods of 1906 and 1907.

Deaths From Typhoid Fever per 100,000 Population.

Providence, R .I., shows		13.7
St. Louis, Missouri	(chem. purif.)	19.1
Youngstown, Ohio	"	39.1
Ithaca, N. Y.	"	25.3
Paducah, Kentucky	"	78.7
Watertown, N. Y.	"	38.2
Paterson, N. J.	"	11.9

Out of the 27 foreign cities there were 15 cities with a mortality figure of 10 or below in 1906, and 14 cities in 1907. Figures as low as 2, 3 or 4 were never reached in any of the registration cities here for the period of 1900 to 1907, except in Decatur, Illinois, for the year 1906, Fitchburg, Massachusetts, for 1903 and 1906, and Madison, Wisconsin, for 1905, taking U. S. census figures as a basis.

The technical detail of our filter plants is not at fault, so what is the explanation? It is stated that where the typhoid fever death rate exceeds 20 per 100,000 of population, the public water supply is open to suspicion. Of the above mentioned six American cities, filtering their water supply, four exceed this figure considerably. The average death rate from typhoid fever in American cities is about 35 per 100,000 of population. There are two possibilities, either our sanitation is deficient and the sources of typhoid fever infection, other than the water supply, not as well controlled as in Western Europe, or we have sources of infection unknown abroad. This would force upon us the question of the "residual typhoid," that is, the typhoid rate after the water and milk supply are thoroughly safeguarded, as well as all other sources of infection. Evidence seems to confirm that there is a "residual typhoid," which, according to E. C. Levy and A. W. Freeman, ("Certain Conclusions Concerning Typhoid Fever in the South, as Deduced from a Study of Typhoid Fever in Richmond, Virginia," read at the regular annual meeting of the American Public Health Association held at Winnipeg, 1908), is twice as high in the South as in the North of this country.

To get further information upon the relation of public water supply to general and specific mortality, a circular letter containing questions relating to the water supply, was addressed to 260 cities, which number includes nearly all the registration cities of the 12th census. The information principally asked for was in regard to any change in the water supply since 1890 up to the present day, and in regard as to mortalities, principally from typhoid fever. I have selected the eight year period, 1900 to 1907, for my figures, for the reason that the statistics for this period are likely to be more reliable than the statistics previous to this date. Furthermore, for the reason that the greater part of the improvements in water supplies has been effected since 1900. Of the answers which I received, a good many had to be discarded for lack of sufficient information, and a good many came too late to be considered in this paper. Fifty-nine cities were finally selected, and their information corroborated as far as possible by State Board of Health and municipal reports.

The cities selected are:

TABLE I.

Columbus, Ohio.	Gloucester, Mass.
Massillon, Ohio.	Brockton, Mass.
Cincinnati, Ohio.	Lynn, Mass.
Cleveland, Ohio.	Haverhill, Mass.
Youngstown, Ohio.	New Bedford, Mass.
Elmira, N. Y.	Lawrence, Mass.
Ithaca, N. Y.	Aurora, Ill.
Olean, N. Y.	Erie, Pa.
Corltand, N. Y.	Williamsport, Pa.
Rochester, N. Y.	Carbondale, Pa.
Auburn, N. Y.	Steelton, Pa.
Watertown, N. Y.	Paducah, Ky.
Binghamton, N. Y.	Louisville, Ky.
Buffalo, N. Y.	Newport, Ky.
Memphis, Tenn.	Jacksonville, Florida.
Providence, R. I.	San Antonio, Texas.
St. Louis, Mo.	Sault Ste. Marie, Mich.
St. Joseph, Mo.	Kalamazoo, Mich.
Concord, N. H.	Escanaba, Mich.
Portsmouth, N. H.	Ann Arbor, Mich.
Raleigh, N. C.	Sacramento, Cal.
Wilmington, N. C.	Minneapolis, Minn.
Beloit, Wis.	Duluth, Minn.
Milwaukee, Wis.	Paterson, N. J.
Holyoke, Mass.	Richmond, Va.
Newton, Mass.	Norfolk, Va.
Springfield, Mass.	Wheeling, W. Va.
Taunton, Mass.	New Orleans, La.
Fitchburg, Mass.	New Haven, Conn.
Bennington, Vt.	

Of these cities, the highest general death rate for the period 1900 to 1907, was reached by Raleigh, North Carolina, with 28.5 deaths from all causes, per 1,000 of population. St. Joseph, Missouri, showed the lowest corresponding figure amounting to 7.9% of population. The highest typhoid death rate of the cities investigated for the eight year period was reached by Steelton, Pennsylvania, with 101.9 per 100,000 of population; the lowest being Concord, New Hampshire, with 11.7 per 100,000. 29 out of the 59 cities used unfiltered surface water for the eight year period, as water from reservoirs, lakes, ponds, brooks and rivers. These are:

TABLE II.

Wheeling, W. Va.	Taunton, Mass.
Buffalo, N. Y.	Fitchburg, Mass.
Auburn, N. Y.	Holyoke, Mass.
Rochester, N. Y.	Richmond, Va.
Steelton, Pa.	New Orleans, La.
Erie, Pa.	Cincinnati, Ohio.
Escanaba, Mich.	Cleveland, Ohio.
Sault Ste. Marie, Mich.	Columbus, Ohio.
Wilmington, N. C.	Louisville, Ky.
Gloucester, Mass.	Newport, Ky.
Brockton, Mass.	Sacramento, Calif.
Lynn, Mass.	Minneapolis, Minn.
Haverhill, Mass.	Duluth, Minn.
New Bedford, Mass.	Concord, N. H.
Milwaukee, Wis.	

The average death rate from all causes for the eight year period in these 29 cities was 17.3 per 1,000. Minneapolis, Minnesota, showed the lowest rate, 10.9; Wilmington, North Carolina, the highest, with 27.7 per 1,000 population. The average death rate from typhoid fever for this period was 45.1 per 100,000 population. Concord, New Hampshire, (record up to 1906 only) had the lowest rate, with 11.7; Escanaba, Michigan, the highest rate, with 140.9 per 100,000 population.

Cities using unfiltered ground water supply exclusively for the period 1900-1908, numbered twelve. They were;

TABLE III.

Memphis, Tenn.	San Antonio, Texas.
Beloit, Wis.	Ann Arbor, Mich.
Aurora, Ill.	Kalamazoo, Mich.
Olean, N. Y.	Portsmouth, N. H.
Cortland, N. Y.	Massillon, Ohio.
Jacksonville, Florida.	Bennington, Vt.

The average general death rate for these twelve cities 1900 to 1907, was 16.9. Olean, N. Y., had the lowest rate, with 12.3; Jacksonville, Florida, the highest rate, with 27.8 per 1,000 of population. The average typhoid fever death rate for the same period amounted to 35.4. Beloit, Wisconsin, showed the lowest rate, with 16.9; Jacksonville, Florida, the highest, with 86.4 per 100,000.

A comparison of the typhoid fever mortality figures in cities with unfiltered surface and ground water, quickly shows the superiority of the ground water supply, the proportion being 45.1 to 35.4. The general mortality figures for the ground water supply cities is likewise lower.

The average general death and typhoid fever rate is even lower than the corresponding rates of the four cities which were using continuously filtered surface water for the period 1900 to 1907, viz.: Lawrence, Massachusetts; Norfolk, Virginia; St. Joseph, Missouri; and Raleigh, North Carolina. The average total death rate for the four cities is 18.4 per 1,000 for the eight year period; the average typhoid fever death rate is 43.3 per 100,000 for the same period. The comparatively high general typhoid fever death rate in these cities can, doubtless, be traced to other responsible factors than the water supplies.

Cities which had a typhoid fever death rate exceeding 20 per 100,000 population, in spite of purification, were

TABLE IV.

(Figures Showing Number of Typhoid Fever Deaths per 100,000 After Established Purification Up To 1907.)

Elimra, N. Y.	(44.3)	
Ithaca, N. Y.	(25.3)	
Watertown, N. Y.	(38.2)	
Raleigh, N. C.	(77.7)	
Youngstown, O.	(39.1)	city statistics.
Paducah, Ky.	(78.7)	
Lawrence, Mass.	(22.3)	
Norfolk, Va.	(59.2)	

Cities filtering their water supply up to 1907, with typhoid fever death rates below 20, were:

TABLE V.

St. Joseph, Mo.	(13.1)
Providence, R. I.	(13.7)
St. Louis, Mo.	(19.1)
Paterson, N. J.	(11.9)
Binghamton, N. Y.	(13.4)

Newton, Massachusetts, with a filter gallery, had a very low typhoid fever death rate, 11.9 for the eight year period.

One can best study the effect of the purified water supply upon the general and typhoid fever death rate by tabulating the mortality figures, and calculating the mortality increase and decrease, respectively. This is done in the following table, taking the eight cities which have improved their water supply during the period, 1900–1908.

Of these eight cities, all show a decrease in the general death rate, except, Watertown, N. Y. There is a percentage reduction of typhoid fever death in each case, Ithaca, New York, leading with a reduction of 76.8. The average reduction in the general death rate of these cities is 5.7%. In the typhoid fever death rate it is 53.8.

The general death rate in a large city is likely to undergo yearly variations quite independently from the water supply, still, in the vast majority of cases, a continuous decrease in the general mortality follows an improved supply. In many cases it is possible to prove that the reduction in the general mortality is out of proportion to the death avoided from typhoid fever, that is to say, that there are many saved from avoided cases other than typhoid fever, probably intestinal disorders to the greatest extent. Whipple states that with each typhoid fever death avoided by an improved water supply, two other lives are spared. Let us see to what extent this statement applies to the figures given above. The general death rate is 17.8 per 1,000 of population, the typhoid fever death rate 64.7 per 100,000 of population, before any improvement in the water supply took place. The percentage with which typhoid fever participates in the general death rate is 3.63 (before change of supply).

After change of the water supply, the typhoid fever death rate is 29.9 per 100,000, respectively 1.68% of the total rate from all causes before the water supply was changed. Consequently. there should be a theoretical reduction of 3.63 minus 1.68, which is 1.95% in the general death rate after change of the water supply.

As a matter of fact, the reduction in the general death rate, after the change, amounted to 5.7%; that is to say, the reduction in the general death rate was nearly three times as much as would be expected from the percent reduction of death of typhoid fever.

TABLE VI.

City	General Death Rate Before Change of Water Supply	Same After	Percentage Reduction	Typhoid Fever Death Rate Before Change of Supply	Same After	Percentage Reduction
Providence, R. I.	19.3	19.0	+ 1.6	21.8	13.7	+37.2
St. Louis, Mo.	18.0	16.1	+10.6	39.2	19.1	+51.3
Youngstown, Ohio	15.6	15.1	+ 3.2	96.1	39.1	+59.4
Ithaca, N. Y.	16.4	15.1	+ 7.9	108.8	25.3	+76.8
Paducah, Ky.	23.4	17.8	+23.9	82.1	78.7	+ 4.2
Watertown, N. Y.	15.5	17.2	—11.1	100.6	38.2	+62.1
Paterson, N. J.	17.2	16.5	+ 4.1	28.2	11.9	+57.8
Binghamton, N. Y.	17.6	17.6	0	40.8	13.4	+67.2
Average	17.8	16.8	+ 5.7	64.7	29.9	+53.8

The application of these figures in every case would be decidedly wrong, but with a very large number of affirmative statistical results and together with our direct and indirect proof of the prevalence of waterborn diseases, I feel safe in declaring Whipple's statement as to the influence of an improved water supply upon the death rate in general as correct. His statement seems to be well borne out by facts and figures.

There is little which can be said of the other waterborn diseases than typhoid fever, and which can be expressed in comparative figures. Our diagnostic methods are imperfect, and more often is the diagnosis itself, consequently statistical figures on intestinal diseases other than typhoid fever, are of little value when we come to direct conclusions.

Concluding, I wish to say that the underlying lessons have been drawn in this country by statisticians and sanitarians alike, and that rigid state and municipal laws are what is needed most in our present state.

Laboratory Section

THE NEED OF QUANTITATIVE METHODS IN EPIDEMIOLOGICAL WORK.*

By CHARLES V. CHAPIN.

The progress of a science is largely dependent upon the extent to which quantitative methods are employed in research. One reason for the unsatisfactory state of sanitary science is failure to use such methods, a failure due in part to limitations imposed by the nature of the problems, and in part it is to be feared by the inability of investigators to appreciate the necessity for their use.

The neglect of such methods is easy, their application difficult, yet there are some notable instances of their successful employment. The art of filtration of drinking water is dependent upon the quantitative study of the bacteria removed, the rate of flow through the filters, the size of sand grains, the depth of sand and various other factors. When it was first found that typhoid bacilli would live for many months in ice, great alarm was felt, but a quantitative study of the problem has shown that the danger was greatly exaggerated. Careful quantitative determination of the vitality of typhoid bacilli and cholera spirilla in different kinds of water, under conditions as nearly natural as possible, though such experiments have not as yet been so extensive as they should be, are furnishing much practical information. Quantitative studies have shown that sulphate of alumina may be used as a coagulent in drinking water, and sulphate of copper as an algaecide, without harmful results. I remember years ago when copper was found on grapes, the vines having been sprayed with Bordeaux mixture, many tons of the fruit were promptly destroyed in a number of eastern cities, though no serious attempt was made to determine whether

* Read before the Joint Session of the Municipal Health Officers' and Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

the amount of copper likely to be consumed was poisonous. Since then much quantitative work has been done on the alleged poisonous properties of various chemicals commonly added to foods, but apparently the work needs to be continued, for there is as yet no accord as to the effect of some of these substances on the users. The finding of, or failure to find bacteria in sewer air, led for years, to all sorts of conclusions as to the danger from such air, but it is only within a very recent period that the quantitative work of Winslow has permitted a final decision. For years a fierce and wordy battle has raged around the question of the part played by cow's milk in the production of tuberculosis, but it is only recently that any concerted effort has been made to determine the comparative prevalence of the bovine and human types of the bacillus. One of the most striking examples of the value of quantitative methods is the production of the antitoxins which would without such methods be impossible.

There are a number of subjects in which I am particularly interested and in which the neglect of quantitative work seems especially deplorable. Because Cornet caused tuberculosis in guinea pigs by injecting dust from rooms occupied by tuberculous patients, it is assumed that most human consumption is the result of breathing pulverized sputum. In the very numerous experiments that have been made there have been very few measurements of the number of living tubercle bacilli in the air of consumptives' apartments, and in the very numerous inhalation experiments with dust and spray, it is rare that an estimate has been made of the number of bacilli present. It seems to be certain that the breathing of large quantities of some kinds of inorganic dust causes serious disease of the lungs, and it is assumed that the breathing of any dust is injurious. But of course this by no means follows, any more than it follows that because 5 percent of carbondioxid is fatal, 0.05 percent is harmful. The whole subject is sadly in need of thorough quantitative study.

A great burden and expense is placed upon the public because it is believed that pathogenic bacteria, when separated from the body, remain alive long enough, and in such quantities, as to be an important factor in the spread of disease. Numerous tests

show that different kinds of pathogens may survive for days, weeks, or months. But if it is asked how many survive, there is no answer. Of a million tubercle bacilli 10 may survive a month, but perhaps 99 percent die within a week, or within three days or within 24 hours. Who knows? There is another and more practical way of measuring this danger, that is, by animal experiment. But who has allowed guinea pigs to live in an apartment recently occupied by a consumptive and noted the number that die of tuberculosis. Who has tried this experiment one week, two weeks, three weeks and four weeks after the removal of the consumptive, and tried it in clean apartments and dirty apartments? No one that I know of, yet we show models of "lung blocks," and if we do nothing else to "stamp out the great white plague," we at least spray formalin.

The question of carriers too is of the utmost importance in preventive work, and though much has been done in this study, far more remains to be done. We need far more accurate data than are now available as to the number of carriers among different classes of persons, their distribution in relation to the sick, and the persistence, number and virulence of the pathogenic organisms.

There is certainly need of a more extended use of quantitative methods by laboratory men, and they are equally a necessity for health officers by whom they have been much neglected. Vital statistics are generally assumed to represent the results of the most accurate quantitative work, as witness the use of percentages carried to the second decimal. But vital statistics often prove a snare when applied to practical uses. When the chemist wishes to make a careful analysis of a substance, it is imperative that he first take a fair sample. It would be well for the statistician to learn from the chemist, for it is only misleading to compare varying percentages of deaths from diphtheria, typhoid fever and smallpox, in different communities or at different times, unless there is evidence of likeness in the populations or due allowance is made for differences.

There are two other fields in which quantitative methods are neglected by health officers. It is imperative for the epidemiologist to determine the relative importance of the different factors in the causation of disease, otherwise there will be an

enormous loss in misdirected effort. It is not enough to prove that a disease may be caused in a certain way, it is necessary for the health officer to know how much of it is caused in that way. How much typhoid fever is due to milk, how much to water, to oysters, to flies, to contact with other cases, with convalescents, with carriers? How much diphtheria is due to the sick themselves, to members of their families, to convalescents, to carriers in the general population, to fomites? How much tuberculosis is due to infection by milk, by meat, by dust, by mouth spray, by contact, by infected houses? It is indeed difficult to answer these questions, but so it is difficult to measure the undulations of the ether, to determine atomic weights, or estimate the distance of the sun, but these difficulties have not deterred physicists, and chemists and astronomers from enthusiastic devotion to their tasks. Until we, too, measure the factors with which we deal, we will continue to go on with our guesswork methods, and will, as in the past, explain every fall in the prevalence of typhoid fever to our own Herculean efforts, and every rise to Divine Providence, or the house fly, or assuming that the existence of the disease is due chiefly to infected water, we may build an expensive filter system only to find that water was a very minor factor in its causation.

No health department has sufficient money for its needs. Expenditures should therefore be made for what will do the most good. We should in all our work carefully measure the cost and the results obtained. Yet how rarely is this done. There are very many ways in which communities are now trying to fight tuberculosis but I know of no serious attempt to measure or even estimate the efficiency of these methods in relation to their cost. Every city in the land is spending money for disinfection after diphtheria, without ever trying to measure the resulting saving in cases and deaths, yet many of these cities think they have no money to hire an injector of antitoxin. We are crowding our hospitals with scarlet fever cases and crying for more buildings, but who has figured the amount of case prevention and the cost per case, and has compared this cost with the expense of district nursing of home treated cases? We spend thousands of dollars for the ventilation of our school houses, but have not a cent with which to abolish the common

drinking cup. Would it not be a good plan to determine the relative effect of the two measures on the health of the children? We complain that councils do not, in appropriation bills, measure the relative values of the health, fire, police and other departments, but would we not vastly improve our position if we could present accurate measurements of our own work? It is not possible to make preventive medicine an exact science, but it is possible to use quantitative methods in many fields hitherto neglected, and to make at least approximate measurements of the value of our work.

PERIOD OF INCUBATION OF INOCULATION RABIES.*

By B. L. ARMS, M. D.,

Assistant Director of the Bacteriological Laboratory of the Boston Board of Health, Boston, Massachusetts.

During the past few years rabies has been quite prevalent throughout the greater part of the United States.

A paper by Drs. Kerr and Stimson of the Public Health and Marine Hospital Service, read in the section on Preventive Medicine and Public Hygiene, at the last meeting of the A. M. A[1]., shows that rabies, with its total of 111 deaths in man in 30 states and with 534 localities in 39 states from which rabid animals were reported in 1908, is a disease that requires a great deal of attention in order that it may be eradicated.

The Wisconsin State Board of Health Bulletin for April-June, 1909, gives the following table as the average period of incubation:

In man	40 days	Cats	14–28 days
Dogs	21–40 days	Pigs	14–21 "
Horses	28–56 "	Goats–Sheep	21–28 "
Cows	28–56 "	Birds	14–40 "

The laboratory is indispensable in the diagnosis of rabies and when we can find Negri bodies, a positive diagnosis can be given in a very short time, but, not finding the bodies, we must go farther and examine the ganglia for rabic tubercles and, as a last resort, animal inoculations should be made.

Formerly rabbits were used almost exclusively for the diagnosis of rabies, possibly from the fact that they were employed to produce the cords for the Pasteur treatment, now guinea pigs are extensively used. Some of the reasons for the use of pigs are here given: they are cheaper, easier to obtain, easier to handle, it costs less to keep them, they occupy less space and they give satisfaction.

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

The question arises how long shall animals be kept before giving a final negative report.

Statements from different laboratories have varied from two weeks to a year, the latter being the practice at this laboratory.

The following figures are from 157 pigs inoculated from March, 1906, to July, 1909, and include all positive animals during that time.

Until late in 1908, we made inoculations from all cases whether Negri bodies were found or not, in order that we might have so much evidence that no one could say the bodies were not pathognomonic.

All inoculations were made in duplicate to give the earliest possible result.

During this time we had 3 pigs which lived 83, 121 and 242 days respectively. In the following table these are omitted from the first column but are included in the second.

TABLE I.

Average time to earliest symptom.........	14.84	17.73
Average time from earliest symptom to death	1.69	2.
Average time from inoculation to death.....	16.53	19.74

All pigs are examined at least twice daily and any symptoms noted. The second table shows the variation in the individual animals:

TABLE II.*

Days	Number of Pigs showing first symptom on designated day	Time in days between first symptom and death	Days between inoculation and death
		19	
1		58	
2		53	
3		18	
4		8	
5		10	
6		5	
7	2	12	
8	4		1
9	8	3	1
10	15		3
11	12		5
12	12		11
13	12		11
14	15		10
15	15		16
16	16		23
17	10		8
18	9		13
19	9		14
20	3		12
21			6
22	5		5
23	1		5
24			4
25	1		
26	1		
29			1
31	1		
32	1		1
33			1
35			1
36	1		
37			1
41	1		
42			
83			1
121	1		1
241	1		
242			1
	156	156	157

*As these figures are taken from animals inoculated into the brain or subdural space, with but one exception, in order to obtain the earliest possible result how much greater must be the variation in the incubation period of rabies in animals bitten at a distance from the brain.

The number of pigs in the first two columns is one short of the total, as one pig, on the 19th day, showed unmistakable signs: excitement, was gaunt, refused food and stood in the peculiar attitude indicative of the early stages of rabies; these symptoms gradually subsided, and a week later had disappeared altogether. There were no further signs until the 79th day, when the same symptoms were noted, which gradually increased, the pig dying 4 days later. Negri bodies were abundant in smears from the Ammon's horn. The mate of this pig died on the 19th day. The material with which these pigs were inoculated had been frozen 79 days before being sent to the laboratory.

The 121 day pig was inoculated into the peritoneal cavity with ¼ c. c. of an emulsion of Ammon's horn, cerebellum and cord from a case showing many Negri bodies in the smear. Two pigs inoculated subdurally from this case died in 16 and 21 days, while this one lived and showed no symptoms that were noted, being found dead.

Smears from the Ammon's horn contained quantities of bodies.

The 242 day pig was spoken of in a paper read before this Association last year.[2]

In view of these figures, it seems to the writer that if animals are kept six months and show no symptoms, they may be reported negative, but such animals should never be used again for the diagnosis of rabies.

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1 Journal of the Am. Med. Assn. Vol. liii, No. 13.
2 Am. Journal of Public Hygiene, Vol xix, No. 3.

REPORT OF THE COMMITTEE ON STANDARD METHODS OF BACTERIAL MILK ANALYSIS.

The Committee on Bacterial Milk Analysis respectfully submits the following report for the consideration of the Laboratory Section of the American Public Health Association.

I.

Historical.

At the meeting of the Laboratory Section of the American Public Health Association in Boston in 1905, at the suggestion of Prof. S. C. Prescott, of the Massachusetts Institute of Technology, a Committee was appointed to study the various methods used for the bacteriological examination of milk and to recommend a uniform procedure. This committee consisted of Prof. S. C. Prescott, Chairman; Dr. W. H. Park, Dr. F. H. Slack, Prof. H. L. Russell, Prof. C. E. Marshall, Prof. H. C. Harrison and Dr. E. C. Levy.

A circular letter asking for information as to existing methods and technique used in bacteriological milk examinations was sent to leading bacteriologists of the United States and Canada. Many of these did not make such examinations, and the replies of others who did, showed wide variations of procedure on most important points, such as plating, composition of media, incubation temperature, length of incubation, etc.

At the Mexico City meeting in 1906, Prof. H. L. Russell, of the University of Wisconsin, was appointed Chairman of the Committee, but in June, 1907, he asked to be relieved of the chairmanship, and by the vote of the Council of the Laboratory Section, Dr. F. H. Slack, of the Boston Board of Health Laboratory, was appointed Chairman.

At the Atlantic City meeting in 1907 the Committee presented a preliminary statement[1], going into the subject matter in considerable detail. Dr. E. C. Levy withdrew as a member of the Committee and Dr. B. H. Stone was appointed in his stead, otherwise the Committee was continued unchanged.

At the Manitoba meeting in 1908 a report of progress was submitted[2] covering some points on which no recommendations were made in the preliminary statement; the Committee was continued without change. The two preliminary reports of the Committee have been favorably received and the technique recommended has been generally adopted. This final report is practically but a restatement of methods hitherto tentatively recommended.

Acknowledgments are due to, and the Committee wishes to express its appreciation of the hearty co-operation and aid given by, the following persons.

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Signed, F. H. Slack, Chairman.
W. H. Park, C. E. Marshall,
B. H. Stone, F. C. Harrison,
H. L. Russell.

II.

Collection of Samples. Technique and Apparatus.

Quantities of Milk Required for Analysis. The minimum quantity of milk necessary for making the ordinary bacteriological examination is ten cubic centimeters. When making examinations for certified milk, if possible a pint or quart bottle should be taken and brought to the laboratory unopened.

COLLECTING APPARATUS. In collecting samples for bacteriological examination it is essential that the sample be taken and kept in such a manner as to prevent either any addition of bacteria from without or multiplication of the bacteria originally present.[3] Bottles, tubes, pipettes, etc. used in the collection of samples, besides being washed, shall be sterilized with dry heat for an hour at about 150° C., or to the charring point of cotton.

In the selection of "certified milk" samples it is recommended wherever possible that an unopened bottle be taken, placed in a suitably iced case and brought at once to the laboratory.

Samples of "market milk" may be collected in the same manner as water samples, in sterile, wide-mouthed, glass-stoppered four ounce bottles; the case in which they are carried being well iced. The principal difficulty encountered in this method is in transferring the sample from the original container to the bottle, and the various string and wire devices by means of which the bottle is immersed in the original container are objectionable both on account of the labor of preparing such an outfit and also on account of the coating of milk left on the outside of the bottle when the sample has been taken.

An apparatus designed for the use of test tubes as containers is recommended as superior to one designed for bottles.[4]

Such a case for carrying the samples may be made of copper with double walls, interlaid with half inch felting, outside measure 19 x 9 x 5 inches, inside 18 x 8 x 4 inches, divided into three compartments, the central one 6 x 8 x 4 inches for the samples, the others each 5 x 8 x 4 inches for ice. When iced and closed a constant temperature of 34° to 36° F. is maintained; salt should not be used with the ice or the samples will be frozen. A layer of absorbent cotton will protect the ice from the air when the box is opened for a few minutes. Bits of this cotton are also useful when taking temperatures for quickly wiping the adhering milk from the thermometer.

The samples are carried in cotton-stoppered test tubes 6 x ¾ inches, the compartment holding eight racks of four tubes each. Holes in the bottom of the partitions allow the water to circulate freely about the lower ends of the tubes.

The test tube racks are made of copper tubing weighted with a strip of lead and padded with rubber. When collecting or plating but one rack or a single tube should be removed at a time and the box closed so the other samples will not be exposed to the outside temperature.

Sterile, straight sided, glass pipettes 18 x 3-8 inches with blunt pipette openings 1-8 inch in diameter at the lower ends are used in transferring the samples from the bottles, cans or coolers to the test tubes; these are carried under the sample case in a detachable copper case 19 x 4 x 3½ inches, adapted for sterilizing and divided into two compartments, the upper one for clean sterile pipettes, the lower for pipettes after use, a sterile pipette being used for each sample.

The use of the test tube for the collection of milk samples is recommended instead of bottles for the following reasons, dependent in most cases on the long, slender shape of the tube.

1. Economy of floor area in the collecting case.
2. The facility for maintaining low temperature by the circulation of the ice water about the lower ends of the tubes, thus giving uniformity in the treatment of the specimens.
3. The case with which all the usual washing, sterilizing and general handling of test tubes can be done, since the test tube is a regular piece of apparatus involving no departure from the routine in all the ordinary manipulations.

With samples kept properly iced in this particular form of case there is practically no change in the bacterial content even for 24 hours, the counts varying hardly more than might be expected in duplicate plates. It is recommended, however, that examination of the samples be proceeded with as quickly as possible after the collections are made.

Identification of Samples. When bottles are used identification numbers should be etched on both bottle and stopper. Test tubes should be labelled or etched and numbered.

A complete record of the samples taken, giving date, time, place, name of party from whom sample is taken, name of collector, temperature of milk, character of original container, (tank, can, bottle), etc., should be written opposite duplicate numbers in a blank book or pocket card catalog, or this informa-

tion may be written on small tags and tied or wired to the corresponding test tube or bottle.

TEMPERATURE. The temperature should be taken immediately AFTER taking the sample for analysis, while the milk is still thoroughly mixed.

If it is desired to take the temperature of "certified milk" this should be done when the sample is taken but from another bottle.

A floating thermometer graduated to the Fahrenheit scale is most convenient and the temperature should be expressed to the nearest degree. It is necessary to standardize the thermometer for at least ten degrees on each side of the legal temperature limit. A quickly registering thermometer should be left for at least one minute in the milk and read as soon as removed.

Representative Samples.—Care should be taken to secure a sample which is truly representative of the milk to be examined.

One of several methods for mixing the milk may be used, comparison having shown the results to be practically the same.[3]

1. Pouring the milk into a sterile receptacle and back.

2. Shaking the milk thoroughly with receptacle turned upside down (this may be done where the can or bottle is tightly stoppered or capped and is not so full as to prevent thorough agitation.)

3. In open tanks in stores it is allowable to stir thoroughly with the long handled dipper generally found in use.

4. Where the test tube collecting case is used thoroughly reliable results are secured by first shaking the can or bottle and then stirring with the large pipette before taking the sample, care being taken to close the upper end of the pipette with the finger so that no milk enters until after mixing, or the pipette may be emptied after stirring before the sample is taken.

5. For certified milk samples it is recommended that on arrival at the laboratory the bottle be opened with aseptic precautions and the milk thoroughly mixed by pouring back and forth between the original bottle and a sterile bottle. Another method is to mix as thoroughly as possible by agitation for two minutes in the original container before opening same.

The interval between collection and analysis.—Generally speaking the shorter the time between collection and examination of milk samples the more accurate will be the results. For

routine work the attempt should be made to plate within four hours of the time of collection.

Too much stress cannot be laid on keeping the samples properly iced during this interval. They should be kept below 40° F., but care should be taken that they are not frozen.

III.

MEDIA. Method of making.[5]

AGAR. The standard medium for determining the number of bacteria in milk shall be agar 1%, reaction +1.5, Fuller's scale, made as follows:

1. Boil 10 grams of thread agar in 500 cc. of water for half an hour and make up weight to 500 g. or digest for 10 minutes in the autoclave at 110° C. Let this cool to about 60° C.

2. Infuse 500 g. finely chopped lean beef for twenty-four hours with its own weight of distilled water in the refrigerator.

3. Make up any loss by evaporation.

4. Strain infusion through cotton flannel, using pressure.

5. Weigh filtered infusion.

6. Add Witte's peptone 2%.

7. Warm on water bath, stirring until peptone is dissolved and not allowing the temperature to rise above 60° C.

8. To the 500 grams of meat infusion (with peptone) add 500 grams of the 2 per cent. agar keeping the temperature below 60° C.

9. Heat over boiling water (or steam) bath thirty minutes.

10. Restore weight lost by evaporation.

11. Titrate after boiling one minute to expel carbonic acid.

12. Adjust reaction to final point desired +1.5 by adding normal sodium hydrate.

13. Boil two minutes over free flame constantly stirring.

14. Restore weight lost by evaporation.

15. Filter through absorbent cotton or coarse filter paper, passing the filtrate through the filter repeatedly until clear.

16. Titrate and record the final reaction.

17. Tube (10 c. c. to a tube) and sterilize in autoclave 1 hour at 15 lbs. pressure or in the streaming steam for twenty minutes on three successive days.

All variations from agar media made as described shall be considered as special media. The above medium is recommended as giving the highest and most uniform counts so far as our comparative work has extended. Methods by which the other media mentioned in this report were made are as follows:

BOUILLON. Infuse 500 g. finely chopped lean meat 24 hours with 1,000 c. c. distilled water in refrigerator. Restore loss by evaporation. Strain infusion through cotton flannel.

Add 1% peptone. Warm on water bath, stirring until peptone is dissolved.

Heat over boiling water, or steam bath thirty minutes. Restore loss by evaporation.

Titrate, adjust reaction to +1% by adding normal sodium hydrate.

Boil two minutes over a free flame, constantly stirring. Restore loss by evaporation.

Filter through absorbent cotton, passing the liquid through until clear. Titrate and record final reaction. Tube, using 10 c. c. to each tube. Sterilize.

AESCULIN BILE SALT MEDIUM. (LIQUID).[6]

Weigh out.
1 or 2% of Witte's peptone.
.5% Sodium taurochlorate (commercial).
.1% aesculin.
.05% Ferric citrate.
100 c. c. tap water.

After steaming 15 to 30 minutes the medium is filtered and filled into test tubes and sterilized (fractional sterilization).

PREPARATION OF AESCULIN BILE SALT AGAR.[6]

The directions for making a liter of aesculin bile salt agar are as follows: Boil until dissolved 15 grams of agar, 2.5 grams commercial bile salt, and 10 grams peptone (Witte) in 1,000 c. c. of distilled water. Neutralize with a normal solution of sodium hydrate. Cool below 60° C., add the whites of two eggs or a sufficient quantity of a solution of albumen, bring to the boil and filter as soon as the albumen has coagulated properly. Try the acidity and neutralize if necessary, and then add to the clear

hot filtrate—1 gram aesculin (Merck) and 1 gram iron citrate scales (Merck). After these substances are dissolved test the acidity with decinormal soda solution. It will be found to be about +0.6, as a solution of 1 gram iron citrate scales in 1,000 c. c. water gives an acidity of +0.56. In case the acidity is too high add alkali until the reaction is +0.6, and if the acidity is too low add more iron citrate until the reaction is +0.6. By following these directions exactly satisfactory and even results will be obtained. We have to emphasize here the different manner of neutralization from that recommended for ordinary media by the Committee on Standard Methods of the American Public Health Association, as the procedure outlined above is absolutely necessary. The main point of our reaction is the forming of the black colored salt in sufficient quantity to form as easily visible field.

LACTOSE (OR DEXTROSE) LITMUS AGAR, made as ordinary agar with the addition of 1% lactose (or dextrose) to the medium just before sterilization. Reaction shall be made neutral to phenolphthalein. If the medium is to be used in tubes the sterilized azolitmin solution shall not be added until just before the final sterilization. If the medium is to be used in Petri dishes the sterilized azolitmin shall not be added to the medium until it is ready to be poured into the dishes.

WHEY AGAR. A liter of fresh skimmed milk at 41° C. is loppered by adding sufficient rennet (about 1 c. c. of liquid rennet in 20 c. c. of distilled water). After the curd is firm it is cut in fine pieces and placed in steam for forty minutes. It is then strained through muslin to remove the curd. The reaction of the whey is adjusted to +1.5 acid with the standardized NAOH and 1% of dry peptone and 1.5% of finely shredded agar is added. It is then placed in the steam for 1 hour. The acidity is readjusted to +1.5%. It is then cooled to 60° C. and clarified with egg. Counterpoised and boiled over a free flame for 5 minutes. Filtered through cotton or a hot, washed plaited filter paper, tubed, sterilized 15 minutes for 3 successive days in steam.

Commercial bile-salt may be obtained from Baird & Tatlock, Cross Street, Hatton Garden, London, England, costing about $2.50 per lb.

IV.

Plating. Apparatus. Techniqub.

Plating apparatus—For plating it is best to have a water bath in which to melt the media and a water jacketed water bath for keeping it at the required temperature; a wire rack which should fit both the water baths for holding the media tubes; a thermometer for recording the temperature of the water in the water jacketed bath, sterile one c. c. pipettes, sterile petri dishes, and sterile dilution water in measured quantities.

Dilutions—Ordinary potable water, sterilized, may be used for dilutions. Occasionally spore forms are found in such water which resist ordinary autoclave sterilization; in such cases distilled water may be used or the autoclave pressure increased. With dilution water in eight-ounce bottles calibrated for ninety-nine cubic centimeters and in test tubes calibrated for nine cubic centimeters, all the necessary dilutions may be made.

Short, wide-mouthed ''Blakes'' or wide mouthed French square bottles are more easily handled and more economical of space than other forms of bottles or flasks.

Eight ounce bottles are the best, as the required amount of dilution water only about half fills them, leaving room for shaking. Long-fibre, non-absorbent cotton should be used for plugs. It is well to use care in selecting cotton for this purpose to avoid short fibre or "dusty" cotton, which gives a cloud of lint-like particles on shaking. Bottles and tubes should be filled a little over the 99 c. c. and 9 c. c. marks to allow for loss during sterilization.

The dilutions recommended are 1-10, 1-100, 1-1,000, 1-10,000, 1-100,000 and 1-1,000,000.

For certified milk the 1-100 dilution should be used, while 1-100 and 1-10,000 will usually be found best for market milk.

The 1-10 dilution is prepared by shaking the milk sample twenty-five times and then transferring 1 c. c. of the milk to a test tube containing 9 c. c. of sterile water.

The 1-100 dilution is prepared in the same way, except that a bottle with 99 c. c. of sterile water is substituted for the test tube.

The 1-1,000 dilution is prepared by first making the 1-100 dilution, shaking twenty-five times and transferring 1 c. c. of the dilution to a test tube containing 9 c. c. of sterile water.

The 1-10,000, 1-100,000 and 1-1,000,000 dilutions are made in the same manner by dilutions of 1-100, 1-1,000 and 1-10,000 dilutions, 1 c. c. to 99 c. c. of sterile water.

It is recommended that that dilution be used which will produce about 200[7] colonies to a plate, ranging from 40 to 200; where a 1-10 dilution exceeds this number the 1-100 dilution is more accurate, etc. The number of bacteria present, may, if desired, be approximately estimated before dilutions are made by direct microscopic examination of a properly prepared sediment. Otherwise, it is necessary to make a range of dilutions, thereafter selecting for record the count obtained on that plate which yields between 40 and 200 colonies.

Plating whole milk is unreliable, whatever quantities be used, since the bacteria are not so well separated as in the dilutions, and often, owing to the crowded conditions, only a portion of the bacteria present will develop into visible colonies. Moreover if a cubic centimeter of the milk is used, the turbidity of the jelly due to the presence of the milk hides the colonies present from the eye.

Porous earthenware Petri dish covers are recommended as superior to glass since they absorb the excess moisture.[8] They also have the advantage of being cheaper and more durable than glass; they are easily marked with ordinary lead pencil. With long incubation a tendency of plates with these covers to dry out has been observed by some workers; for ordinary routine work however they are perfectly satisfactory using 10 c. c. of media to the plate and incubating in a saturated atmosphere. These covers should never be washed but always thoroughly dry sterilized before use.

Another method of preventing spreaders is by inverting the dishes and placing in the glass cover of each a strip of sterile filterpaper moistened with one large drop of glycerine. Plates so treated do not dry out as quickly as with the porous tops and the glass ware does not become scratched.

PIPETTES. Straight sides 1 c. c. pipettes are more easily handled than those with bulbs; they may be made from ordinary 3-16 inch glass tubing and should be about 10 inches in length.

PLATING TECHNIQUE.[9] The agar after melting should be kept in the water jacketed water bath between 40° C. and 45° C. for at least fifteen minutes before using to make sure that the agar itself has reached the temperature of the surrounding water. If used too warm the heat may destroy some of the bacteria or retard their growth.

For routine work in cities in order to bring down the actual number of colonies in a plate to about the standard of two hundred, it is well to use a dilution of 1-10,000. To make this dilution use two bottles of sterile water each containing 99 c. c.

Shake the milk sample twenty-five times, then with a sterile pipette transfer 1 c. c. to the first dilution water and rinse the pipette by drawing dilution water to the mark and expelling; this gives a dilution 1 to 100.

Shake the first dilution twenty-five times, then with a fresh sterile pipette transfer 1 c. c. to the second dilution water, rinsing the pipette to the mark as before; this gives a dilution 1-10,000. Shake the second dilution twenty-five times, then with a sterile pipette transfer 1 c. c. to the Petri dish, using care to raise the cover only as far as necessary to insert the end of the pipette.

Take a tube of agar from the water bath, wipe the water from outside the tube with a piece of cloth, remove the plug, pass the mouth of the tube through a flame, and pour the agar into the plate, using the same care as before to avoid exposure of the plate contents to the air.

Carefully and thoroughly mix the agar and diluted milk in the Petri dish by a rotary motion, avoiding the formation of air bubbles or slopping the agar, and after allowing the agar to harden for at least fifteen minutes at room temperature place the dish bottom down in the incubator.

CONTROLS. Plating should always be checked by controls. A blank plate should be made with each series of milk plates for control on the agar, water, air, Petri dishes, pipettes, etc.

For control of the technique of plating, it is recommended that for work on "market milk" duplicate plates be made each day on several samples.

"Certified milk" should always be plated in duplicate and where it is possible it is well to have one man's work occasionally checked by another.

Unless duplicate plates show as a rule approximately the same count the worker should see if there is error in his technique.

Plating should always be done in a place free from dust or currents of air.

In order that colonies may have sufficient food for proper development 10 c. c. of agar shall be used for each plate. In plating a large number of samples at one time, the dilution and transfer of diluted milk to the plates may be done for four or eight samples, then the agar poured, one tube to each plate, then another eight samples diluted, etc.

V.

Incubation and Counting.

Two standard temperatures are recognized.

1. 48 hour incubation at 37° C.
2. Five day incubation at 21° C.

Regulations governing the number of bacteria allowable in milk should direct the method to be used in examination and in all reports, papers, etc., on the bacterial count of milk this factor should be explicitly stated.

Incubators should be carefully regulated. Whatever temperature of incubation may be used it is important that the incubator air should be saturated with moisture; this may be accomplished by either having a depression in the floor of the incubator filled with water or by setting a pan of water on one of the shelves.

Counting. Expression of results. Since minor differences in milk counts are within the working error of the methods and are of no significance in practice, the following scale has been adopted for recording results of market milk examination.

Counts below 50,000 are distinguished by five thousands.

Counts between 50,000 and 100,000 are distinguished by ten thousands.

Counts between 100,000 and 500,000 are distinguished by fifty thousands.

Counts between 500,000 and 5,000,000 are distinguished by hundred thousands.

Counts above 5,000,000 are distinguished by millions.

Therefore only the following figures are used in reporting.

5,000	400,000
10,000	450,000
15,000, etc., to 50,000	500,000
60,000	600,000
70,000	700,000
80,000	800,000
90,000	900,000
100,000	1,000,000
150,000	1,100,000, etc., to 5,000,000
200,000	6,000,000
250,000	7,000,000
300,000	8,000,000, etc., by millions.
350,000	

Counts on "certified" or "inspected" milk shall be expressed as closely as the dilution factor will allow.

The whole number of colonies on the plate shall be counted, the practice of counting a fractional part being resorted to only in case of necessity, such as partial spreading.

Various counting devices have been recommended by different workers. The more simple ones, where the whole plate can be seen at once, are more desirable on account of there being less likelihood of recounting colonies. Colonies too small to be seen with the naked eye or with slight magnification shall not be considered in the count.

VI.

Milk Sediments.

It is probable that within the past five years more research work has been done in relation to the various sediment or centrifuge tests for milk than any other method of examination.

These tests were originally started with the idea of detecting mammitis by noting the increase in the polynuclear cells and have become amplified to such an extent that excepting for certified milk a fairly satisfactory bacterial analysis of milk may be made by these methods alone. Roughly these tests now include (a) Estimation of leucocytes, (b) Estimation of number of bacteria together with morphology of same, (c) Estimation of

foreign matter, dirt, feces, etc. It is however impossible to group them separately under these headings since by some of the methods all of these determinations are made. For the most accurate leucocyte counting the Doane-Buckley test as modified by Russell and Hoffman is recommended, while the Stewart method as modified by Hill and Slack is recommended for routine inspection work.

Leucocytes are present in all normal milks and their number occasionally fluctuates greatly without apparent cause. Milk from animals suffering from udder inflammations almost constantly shows a high leucocytic content and without question is unfit for human consumption.[10]

While there is no point in the milk from a single animal where we can say it passes from normal to abnormal in this respect, enough research has been made to prove that the mixed milk from several normal animals very seldom exceeds 500,000 leucocytes to the cubic centimeter. While healthy cows with no distinguishable lesions may occasionally for short periods pass this limit, such variations are very transient in character and if the mixed milk from several cows shows such high content of leucocytes it raises a suspicion of some abnormal condition.[11]

While a leucocytic count of 500,000 or more to the cubic centimeter in the case of a single animal may be transient and negligible, when found in mixed milk it is sufficient evidence to warrant the exclusion of such milk from the market, until satisfactory veterinary inspection of the herd is made.

Stokes[12] devised a microscopic examination of milk for pus cells and streptococci as a means of detecting the presence of mammitis among cows supplying the milk. Centrifugal sediment from ten cubic centimeters of milk was stained and examined with one-twelfth oil immersion lens. He regarded the presence in the milk of an individual cow of five cells per field of the oil immersion lens as justification for excluding the animal from the herd.

Bergey[13] modified Stoke's method and made extensive examinations of the milk of individual cows. Parallel bacteriological examinations of the milk for both species and numbers supplemented his examinations for cells.

Tromsdorff[14] devised a method which consists in centrifugalizing 5 c. c. of milk in a special centrifuge tube with a lower constricted portion so graduated as to permit of reading off directly the amount of sediment. The mixed milk of cows with sound udders, as a rule, shows sediment varying from traces to .5 c. c. per liter with 1 c. c. per liter as the maximum. Trommsdorff recommends the test as an aid in the detection of chronic mammitis.

Stewart[15] of the Philadelphia Bureau of Health further modified Stoke's method so that it was practicable to use it for the examination of large numbers of samples of mixed herd milk. Stewart describes the apparatus and method as follows:

"This apparatus consists of a circular pan about 12 inches in diameter and ¾ inches deep, containing twenty small glass tubes. The tubes contain 1 c. c. of milk and are filled by means of a small bulb similar to that ordinarily used on medicine droppers. The end of the tube is closed by a small rubber stopper, and the tubes are held in the pan by clamps. This pan is fitted upon the ordinary Beckel water centrifuge and covered with a lid which is held down by a thumb screw. The pan covered in this way furnished a surface of very slight resistance to the atmosphere during its revolution, somewhat on the principle of a child's top."

By the old method the arms of centrifuge containing the milk encountered so much resistance in their revolution that the speed with 15 lbs. water pressure was not more than 1,200 revolutions per minute, while the speed obtained with the new apparatus is from 2,500 to 3,000 revolutions per minute with 15 lbs. pressure. This rapid speed causes sedimentation to occur in less than five minutes. When this is completed the centrifuge pan can be lifted from the motor and the per cent. of cream measured by a graduated scale marked upon the tube. The heavier matter, as the insoluble dirt, pus cells and bacteria, is thrown to the peripheral end of the tub where it adheres to the rubber cork in the lumen of the tube. To examine this sediment the cork is carefully removed and a spread made by rubbing the cork containing the sediment over an area of a square centimeter on a 3-inch by 6-inch glass slide. The proper area of the smear is obtained by placing underneath the slide a scale of circles having an area of

a square centimeter. After the smears are dried in the air without fixation of heat, the preparation is stained by the Jenner blood stain for two minutes, keeping the stain in constant motion. The excess of stain is washed off in water and the preparation is dried in the air. By this blood staining method the pus and blood cells are stained perfectly and the ordinary micro-organisms take the blue stain well.

The stained specimens are examined with a one-twelfth oil immersion objective and a No. 3 eye piece. The character of the bacteria is noted and the average number of pus cells per field is counted. This average number is multiplied by 4,400 since there are about 4,400 fields to a square centimeter as estimated by the stage micrometer. This result is approximately the number of pus cells per cubic centimeter.

Hill & Slack[16] modified the Stewart method by using tubes of a larger bore containing two cubic centimeters, stoppered at each end, centrifugalizing at a speed of 2500 revolutions a minute for 10 minutes and smearing the sediment evenly over 4 square centimeters with a drop of sterile water. The advantages claimed over the Stewart method are:

The tubes are so large that there is practically no capillary action. The time of centrifugalizing is increased. The use of water with the smear allows of a thin even smear, the small amount of material of the same dilution left on the stopper being negligible for all practical purposes.

The number of leucocytes per 1-12 oil immersion field multiplied by 20,000 gives the approximate number per cubic centimeter.

So little of the sediment is seen at once with the high power that it is well to confirm the diagnosis of pus by making a thorough examination of the whole surface with a low power lens, to determine how uniform a smear has been made. By using an eye-piece micrometer ruled in squares, the relation of one square to that of 1-12 immersion lens being previously calculated, a count may be made with the low power lens.

The Doane-Buckley[17] quantitative method of estimating leucocytes is described by them as follows:

"With this method ten cubic centimeters of milk are centrifuged for four minutes in graduated sedimentation tubes, at an approximate speed of 2,000 revolutions per minute. The

cream is lifted out with a cotton swab, care being taken to get as much as possible of the fat. It is then centrifuged one minute more and the cream again removed with a cotton swab. Any fat remaining in the milk interferes seriously with the counting, as, if there are more than a few globules they form a layer on the top of the liquid in the counting chamber, and as the leucocytes settle to the bottom of the chamber, it is difficult to see through the fat. It is only with cows giving milk difficult of separation where this trouble is experienced, and with such animals considerable care is necessary in removing all the cream gathered at the top of the sedimentation tube. The method of removing the fat with cotton is the best one that has occurred to us, and it is the only part of the process that does not operate with entire satisfaction in every instance.

Following the removal of the cream, after the second centrifuging the bottom of the tube will contain a portion of the sediment which is easily seen. This sediment may, in extreme cases of cows suffering from garget amount to as much as one cubic centimeter. Ordinarily it will be considerably less than one-half cubic centimeter. The amount varies considerably with the number of leucocytes, but not absolutely. The milk above this sediment is removed with a small siphon, which can be easily arranged with bent glass tubes drawn to a fine point and supplied with a small rubber end pinch cock. In using the siphon it is better to keep the point near the surface of the milk in the tube in order not to agitate the precipitated leucocytes and draw a number of them off with the milk. The milk in the tube may be siphoned within an eighth of an inch of the sediment in the tube. This will usually be below the ½ c. c. mark. Two drops of saturated alcoholic solution of methylene blue are then added, thoroughly mixed with the sediment by shaking, and then set in boiling water for two or three minutes to assist the leucocytes in taking the color. The contents of the tube can be boiled by holding it directly in the flame, but it has no advantage over the use of the water bath, and it is very likely to break the glass. After heating, some water is added to the tube to render the color less dense. Ordinarily filling the tube to the 1 c. c. mark will be sufficient, and this quantity gives an easy factor for calculating the final results.

In putting this liquid containing the leucocytes into the blood counter considerable care is necessary, owing to the tendency of the leucocytes to sink to the bottom. At this place a capillary tube is used, and the cover glass was held in one hand ready to cover the chamber as soon as the drop was transferred to the counting counter. After placing the glass cover over the chamber, about a minute is allowed the leucocytes to settle to the bottom of the chamber. There are very few foreign bodies likely to be mistaken in counting for leucocytes. Ordinarily the polynuclear leucocytes predominate and the stained nuclei with the unstained surrounding cell show up very distinctly. A few small leucocytes with large nuclei may be found and these may be confounded with yeast cells until the worker becomes familiar with the distinction.

As regards counting we have taken a standard with a cubic centimeter as a basis quantity of milk, though we are of course aware that the corpuscles in the blood are enumerated with a cubic millimeter basis. We adopted the centimeter largely for two reasons. In counting bacteria in the milk the cubic centimeter is always the basis employed. Simply because the leucocytes were derived from the blood seemed to be no reason why the same basis for counting should be employed as was used with the blood, while to the ordinary bacteriological worker to whom this work will fall, if ever adopted to any extent, the cubic centimeter standard would be a little more easily comprehended because more frequently used. The blood counter holds one-tenth cubic millimeter and one-ten-thousandth cubic centimeter. If ten cubic centimeters of milk are used and the 1 cubic centimeter of fluid is in the tube after siphoning, and the coloring matter and the water used to dilute has been added, then the resulting number of leucocytes in the counting multiplied by 1,000 will be the total number of leucocytes per cubic centimeter in the milk. If a total of 75 leucocytes was counted in the chamber there would be 75,000 leucocytes per cubic centimeter in the milk.

In the actual counting under the microscope a square millimeter of the counting chamber will be found to be ruled off into 400 smaller equal squares. This facilitates an accurate and rapid count. Where the number of leucocytes is not great the

entire field can be counted in a short time. Where there is a great number of leucocytes a few squares or sets of squares in different parts of the ruled surface will give approximately the number.

There are occasionally a few variations desirable from these rules, but it may be well to state that the details have been pretty carefully and thoroughly worked over and compared, and it is seldom that short cuts can be made if correct results are desired. The time and speed of centrifuging are placed as low as possible for accurate work. When there is one-half c. c. or more of sediment, it is necessary to use more of the methylene blue for staining, as there will be too great a number of leucocytes to make a satisfactory count in the counting chamber, it is better to add water until there are two cubic centimeters, or sometimes even more in the sedimentation tube.

This method of counting, while long in explaining is in reality short and simple in application. Moreover, it is based on accurate measurements in every detail, and the results are correspondingly reliable."

Savage[18] devised a method similar to that of Doane & Buckley which, like theirs, shows large numbers of leucocytes in the milk of normal cows.

Russell & Hoffman[19] working farther with the Doane & Buckley method have made several modifications and recommend the following procedure:

Collection of Samples. Samples for analysis should be taken from the entire milking of the animal, as the strippings contain a somewhat larger number of cells than other portions of the milk. For the purpose of examination take 200 c. c. in stoppered bottle.

Time Interval between Collection and Analysis. To secure satisfactory results, milk must be examined in a sweet condition. Development of acidity tends to precipitate casein in the milk and thus obscure the examination of microscopic preparations. Samples received from a distance can be preserved for satisfactory microscopical examination by the addition of formalin at the time of collection—a proportion of 1 c. c. to 250 c. c. of milk. Formalin has been found the best preservative to use although it causes contraction of the cells to some extent.

PROCEDURE WITH REFERENCE TO PREPARATION OF SAMPLE.

1. Heating sample.—To secure the complete sedimentation of the cellular elements in the milk, it is necessary to heat the same to a temperature which will break down the fat globule clusters, or lessen the ordinary creaming properties of the milk. Samples should be heated at 65° to 70° C. for not less than ten minutes, or from 80° to 85° where very short periods of exposure (one minute) are given. This treatment causes the more homogenous distribution of the fat globules through the milk, and when the sample is then subjected to centrifugal force, the cell elements are not caught in the rising fat globules, but on account of their higher specific gravity are concentrated in the sediment by centrifugal force.

2. Concentration of cellular elements—Ten c. c. of milk are placed in an ordinary sedimentation tube, and after heating as above directed and subsequently shaking, the milk is centrifugalized twenty minutes at 1,200 revolutions per minute. A hand centrifuge may be employed for this purpose; where available a steam turbine Babcock milk tester may be found more practicable.

NOTE.—This speed maintained for the time mentioned, is sufficient to sediment practically all the cell elements suspended in the milk. In our experience we have found the number of cells in supernatant milk to average only 3½%.

3. Preparing the sample for examination—After centrifugalizing, the cream and the supernatant milk are removed, with the exception of the last ½ c. c., by aspirating with an exhaust pump and wiping the walls of the tube with a cotton swab. After thoroughly mixing the sediment with a glass rod, enough of the emulsion is placed in an ordinary blood counter (Thoma Zeiss pattern) to fill exactly the cell. The preparation is then allowed to stand for a minute or two to permit the cellular elements to settle to the bottom of the cell while the few fat globules in the liquid rise to the surface. This method permits of the differentiation of the cells from the small fat globules, in the liquid rise so that a distinct microscopic observation can be made.

EXAMINATION OF MATERIAL. The preparation is examined in an unstained condition.

NOTE.—Most observers have usually stained the sediment prior to examination, but we have found with the above treatment that the cells may be enumerated quite as well in an unstained condition as a stained condition.

The count is made with a one-inch eye piece and 1-6 objective. Where the number of cell elements exceed 12 or 15 per microscopic field, above referred to, one-fourth of the entire ruled area of the counter, equivalent to 100 of the smallest squares of the cell, are counted. Where the cell elements are less abundant, one-half of the entire area (two to four hundred squares) are enumerated. The average number of cells per smallest square is then obtained, which when multiplied by 200,000 gives the number of cells per cubic centimeter in the original milk; multiplied by four million we have the number of cells per cubic cenitmeter in the sediment examined. As the sediment represents the concentration of cells into one-twentieth of the original volume of milk taken (10 c. c. to one-half c. c.) this number should be divided by twenty to give the number of cells per cubic centimeter in the original milk.

NOTE.—The above factor of 4,000,000 is obtained as follows: The cubic content of the blood counter represents one-tenth of a cubic centimeter. This volume is divided by means of the ruled scale into 400 small cubes each equal to one four-thousandth of a cubic millimeter, or one four-millionth of a cubic centimeter.

EXPRESSION OF RESULTS. All results should be expressed in number of cells per cubic centimeter of the original milk, and in order to avoid fictitious accuracy, should be given in accordance with the method adopted by the Committee on Standard Methods of Water Analysis, as reported in the report in the Laboratory Section of the American Public Health Association for 1905, page 94.

STONE & SPRAGUE have devised a centrifuge tube for quantitative and qualitative analysis of milk sediment which is practically a combination of the Stewart and Trommsdorff tubes, being a 15 c. c. tube, the lower portion of which is drawn into a finely graduated tube about 1-16 inch in diameter and closed with a rubber stopper.

For this method of examination they claim the following advantages:

"First, it measures more accurately the sediment. Second, smears of the sediment can be made in the same manner as with the Slack tube. Third, the column of sediment tends to become stratified so that the different elements can be easily made out. Fourth, the tubes are much more easily cleaned. With this tube we have been able to detect without microscopical examination, the presence of cases of acute mastitis when the milk was diluted thirty times with normal milk. For ordinary routine work we think that centrifugalization in these tubes, using one-tenth cubic centimeter of a leucocyte sediment to fifteen cubic centimeters of milk, in a filled tube, as a maximin limit, will be of as much value as a count. The character as well as the quantity of the sediment should of course be taken into consideration. A sediment from cases of even slight mastitis practically always having a yellowish or pinkish tinge of pus, mixed with a smaller or larger amount of blood. Microscopical examination usually shows red cells as well as pus cells. This test should of course be supplemented by an actual examination of the herds in every case."

The Microscopic Estimate of Bacteria. (Slack).[20] "The apparatus and the method for making the microscopic estimate are as follows: The special apparatus for centrifugalizing the milk, modified from one used for leucocyte estimation by Stewart of Philadelphia consists of an aluminum disk and cover, 10 inches in diameter and 5-8 inch in depth, fitted to hold twenty small glass tubes arranged radially. These tubes hold about 2 c. c. each and are closed at both ends with rubber stoppers.

The milk samples are thoroughly shaken, the tubes filled, stoppered, inserted into their proper numbered receptacles in the disk, and centrifulgalized for ten minutes at a speed of from two to three thousand revolutions per minute. Thus in each tube the whole sediment from a known quantity of milk is obtained, and may be spread over a given area. A space about 4 sq. cm. is most convenient, being the right size to allow thorough emulsion of the sediment with a drop or two of sterile water, and to permit drying into a thin even smear. It is convenient to smear a number of samples consecutively on a long glass slide which has previously been correctly spaced with a blue pencil.

To obtain the sediment with the least disturbance, the stopper is first removed from the inner, or cream end, then the tube is held with the cream end downwards, the cream removed with a platinum loop and the milk poured out; lastly, still holding the cream end down, the other stopper is carefully removed with the adhering sediment and the sediment smeared evenly with a drop of sterile water over the space on the glass slide, the stopper being rubbed directly on the glass until the sediment has been transferred. When this is properly done the amount of diluted sediment remaining on the stopper is practically negligible. The smear is then dried with gentle heat and stained with methylene blue.

The microscopic examination of a milk sediment thus easily prepared reveals more than any other single test. It shows the character of the milk, the approximate number and morphology of the bacteria, and the presence of pus or streptococci.

It is not claimed that all the bacteria in the milk subjected to centrifugalization are precipitated into the sediment; but it is claimed that in 99 per cent. of the samples a representative number, is so precipitated, and that this number bears a fairly constant relation to the 1-10,000 dilution plate culture when grown in a saturated atmosphere at 37° C.* for twenty-four hours, 1 per cent. agar being used with a reaction of +1.5.

We may say as a rough estimate, that each coccus, bacillus, diplococcus, or chain in the 1-12 oil immersion field represents one colony in the 1-10,000 plate from the same sample. In most cases the count of a representative field multiplied by 10,000 gives approximately the number of bacteria per cubic centimeter. By the use of this method a good idea of the condition of a single sample of milk can be obtained in less than twenty minutes. Thirty samples can be examined in an hour. At the contractor's receiving station one can easily examine 100 to 200 samples daily, thus keeping close watch over the dairies.

In ordinary routine city inspection only those samples need be plated which are doubtful or above the limit established. In this work the plate would corroborate the microscopic findings

* The method was originally worked out in relation to the 24 hour count at 37° C. The exact factor would have to be figured in accordance with the area of the 1-12 immersion field of the individual microscope. The value of the test lies, however, not in accurate counting so much as in the decisive picture obtained of the character of the milk.

and strengthen the evidence of the court cases. Where plates are to be made the microscopic estimate gives an indication of the proper dilution to use.

VII.

Special Bacteria and Tests for Same.

Pathogenic Organisms. Typhoid and diphtheria bacilli are rarely sought for in milk because it is recognized that although these diseases are often conveyed in milk, the period of incubation is such that by the time the outbreak on a special route is noticed the contagion has usually disappeared from the the milk.[21] Typhoid may be isolated by the use of Lactose bile medium as recommended by Jackson and Melia.[22]

Tubercle Bacilli in Milk.[23] Collection of samples and technique. "Pint or quart samples of milk should be obtained, kept well iced, and delivered to the laboratory as soon as possible. The milk and cream should be well mixed by shaking vigorously. 50 c. c. of the mixed milk are then transferred to a large centrifuge flask and 100 c. c. of sterile water added. Centrifuge for one hour at 2,000 revolutions per minute. The milk was diluted with twice its volume of water with the idea that it would decrease the specific gravity of the milk and so permit of the easier sedimentation of the tubercle bacilli. Guinea pigs are then inoculated, subcutaneously in the belly wall, with 5 c. c. of the sediment thus obtained. The guinea pigs not dying in at least two months are chloroformed, after being tested with tuberculin, and careful autopsies made. Smears, cultures and sections are made from the various organs of the animals that show any change from the normal. The smears are stained with carbol fuchsin and examined for acid fast bacilli.

Cultures are made on glycerinized potato and glycerine agar to rule out Rabinovitch's quick growing acid fast butter bacillus.

Sections are stained with carbol fuchsin for tubercle bacilli and also with haematin and eosin for histological appearances.

Tuberculous guinea pigs may be differentiated from non-tuberculous by giving sufficient crude tuberculin (2 c. c.) subcutaneously to cause the death of the tuberculous animals in twenty-four hours.

Of about 250 guinea pigs tested in this way no animal that did not have tuberculosis died. Two or three that had slight lesions did not die but became sick. It was noted that all the animals died whose lesions had become caseated.

The reaction seems of distinct service in eliminating infections with acid fast organisms and the suggestion is made that with some modification the procedure may have a distinct place as an aid in differentiating true tuberculosis from infections with other acid fast organisms which produce tubercular-like lesions." It is of course understood that the examination of milk for tubercle bacilli is by the very nature of the test limited. For the control of this disease in cattle we must rely upon the tuberculin test.

WISCONSIN CURD TEST.[24] The Wisconsin curd test is conducted as follows:

1. Sterilize milk containers so as to destroy all bacteria in vessels. This step is very important and can be done by heating cans in boiling water or steam for not less than one-half hour.

2. Place about one pint of milk in a covered jar and heat to about 92° F.

3. Add ten drops of commercial extract of rennet and mix thoroughly with the milk to quickly coagulate.

4. After coagulation cut curd fine with case knife to facilitate separation of whey; leave curd in whey one-half hour to an hour, drain off whey at frequent intervals until curd is well matted.

5. Incubate curd at 98° to 100° F. immersing jar in warm water. Keep jars covered to retain odors.

6. After six to nine hours incubation open jars and observe odor, examine curds by cutting with sharp knife and observe.

7. Very bad milk will betray the presence of gas-producing bacteria by the spongy texture of the curd and will have an off-flavor.

8. If more than one sample is tested at the same time, dip knife and thermometer in hot water before each time used."

As a rule milks showing the presence of gas or bad odors in any considerable degree are milks that have been more or less polluted with extraneous organisms or carelessly handled, and as a consequence such milks show a curd filled with pin holes due to

gas. It is not intended that this test should be used for an absolute indication of the presence of gas-producing organisms, but rather it has been of service in the detection of the condition of market milk. It is possible that a milk containing but few bacteria may give a very undesirable curd. In order to obtain a good curd we must either have a milk which contains almost no bacteria or one which contains large numbers of lactic acid organisms. While more valuable in testing milks for cheese making it is useful in the examination of market milk if used with judgment. Work done with this test for the detection of fecel matter shows that positive results can be obtained from other gas formers than *B. coli*. The advantage of the test is that it is simple to perform in the dairies and very quick in its results, determinations being made over night. The disadvantage is that while it is a valuable indicator it is by no means a sure test for fecal matter.

Other methods of detecting gas-producing organisms in milk—Gas producing organisms may be tested for in milk, as in water, with glucose or lactose broth in fermentation tubes. Test similar to presumptive test for *B. coli* in water analysis may be made by inoculating into these broth fermentation tubes a c. c. each of the 1-100, 1-1,000 and 1-10,000 dilutions, or if *B. coli* organisms are to be numerically determined the milk may be plated in lactose litmus agar, red colonies counted and species tests worked out. Lactose-bile medium has also been used for the determination of *B. coli* in milk.

The presence of these gas-producing organisms in abundance usually indicates dirty conditions of stables, cows or vessels. In small quantities they may be found in most milks.

In Baltimore routine examinations are made for *B. coli* in milk in 1-1,000 c. c. of each sample.

One c. c. of the 1-1,000 dilution is placed in ordinary bile containing 1% lactose in a fermentation tube and allowed to stand at 37° for 72 hours, at the end of which time if there is more than 15% gas, plates are made, colonies isolated and run through species tests. Of many hundred examinations the colon bacillus is found in about 25% of the samples in winter and 75% in summer in 1-1,000 of a c. c.

The following table prepared from the results of the routine examination of the Baltimore milk supplies for 1906 shows that the colon bacillus is more apt to be present in milk of high bacterial content.

Number of Bacteria	No. of Samples	*B. coli* present 1-1000 c. c.	*B. coli* absent 1-1000 c. c.
10,000 and under........	32	15%	85%
50,000 and under........	92	20%	80%
500,000 and under.......	236	30%	70%
500,000 to 1,000,000.....	64	66%	34%
1,000,000 and over.......	338	72%	28%

GAS PRODUCTION may be demonstrated by adding to a measured quantity (10 c. c.) of milk in a fermentation tube either 3 c. c. of 5% solution of carbolic acid or 1 c. c. of a sterilized 2% solution of bile salt containing neutral red in sufficient quantity to give the milk a deep pink color. Incubate for 24 hours at 37°. The chemicals evidently inhibit the growth of the lactic acid bacteria. Where neutral red is used if the gas producing bacteria are in large numbers the deep pink of the milk is changed to a canary yellow.

Dextrose litmus agar and lactose litmus agar are of use in differentiating acid formers, the former giving better results.

Whey agar favors the growth of lactic acid organisms, but is unfavorable for other types.

In incubation at 21° C. the addition of 1% lactose to agar has given higher counts than agar without.

DETERMINATION OF STREPTOCOCCI.[16] "Although by careful searching a few streptococci will be found in most sediments from pus milk they are seldom found to any great extent by direct microscopical examination. Occasionally a sample will be found crowded with long chains; more often, streptococci, if present, are in the form of diplococci or very short chains.

Where streptococci, diplococci or cocci are found in the sediment and the plate from the same sample contains colonies resembling streptococci colonies, these colonies may be grown in bouillon to see if chains will develop.

First make and record an estimate of the number of such colonies present, then transfer from 10 to 50 of them to bouillon and grow for 15–24 hours at 37° C. To examine the bouillon culture, spread a loopful on a glass slide, fix with heat, fix with alcohol while slide is still quite hot, stain with methylene blue, wash immediately, dry and examine.

Streptococci in small numbers are present in most market milks as shown by Heinemann and many of the short chain varieties are undoubtedly at the time harmless, though by passing through animals their pathogenicity may become marked.[25]

Long chain streptococci are more apt to indicate inflammatory reactions[26] and milk containing these in large numbers is certainly not a safe article of diet.

A milk should not be condemned because a few chains are found together with large numbers of other microscopic organisms in a bouillon culture, but it is safer to exclude a milk from the market when these three tests agree.

1. Microscopic examination of the sediment shows streptococci, diplococci or cocci.

2. The plate from the same sample shows colonies resembling streptococci colonies exceeding a count of 100,000 to a cubic centimeter.

3. The bouillon culture from these colonies shows long chain streptococci alone or in great excess compared with the other bacteria present."

Milk showing in the stained sediment both abundance of long chain streptococci and pus should be condemned as unsafe.

VIII.

Laboratory Procedure on Routine Samples.

The following procedure is recommended for routine work.

1. Centrifugalize, make smeared sediment, stain and examine microscopically for approximate number of leucocytes, approximate number of bacteria, types of bacteria, streptococci, etc.

2. Plate at least those samples, as indicated by the microscopical examination which show bacterial content around or more than the number permitted by the regulation.

3. Incubate 48 hours at 37° C. or 5 days at 21° C.

4. Count colonies.

5. From plates showing numerous pin point colonies transfer ten or more to broth and grow 15–24 hours and examine for streptococci.

IX.

INTERPRETATION OF RESULTS.[27]

BACTERIAL COUNT. A high bacterial count in milk indicates lack of cleanliness in production, or lack of care after production. Age of the milk is also an important factor and in interpreting results the distance milk has to be brought, etc., should be taken into consideration. Thus a count of 100,000 bacteria to a cubic centimeter should be considered a serious contamination in milk which may be delivered to the consumer within a few hours of production, while a count of no higher than 100,000 in milk produced at a distance and say 24 to 36 hours old is evidence of ordinarily good care. To produce a milk averaging under 10,000 bacteria to the cubic centimeter requires the utmost care and watchfulness of each detail.

LEUCOCYTES.—A leucocytic content of 500,000 or over to the cubic centimeter especially in testing mixed milk should be regarded as suggestive of some inflammatory condition of the udder and the milk excluded until after satisfactory veterinary inspection.

Indication of the presence of pus is more sure if the leucocytes are clumped.

STREPTOCOCCI. Long chained streptococci are sometimes found in the smeared sediment especially in pus milks, their presence in such smears or when found by the plate method in numbers of over 100,000 to the cubic centimeter should be considered sufficient evidence for exclusion of the milk until after satisfactory veterinary examination of the cows.

B. COLI are present in most milks, their presence in large numbers in milk should be regarded as evidence of unsatisfactory conditions at the dairy.

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REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE EXAMINATION OF AIR.

I. Synopsis.

The most important impurities of air, which it is possible to detect and measure in sanitary investigations, are physical, rather than chemical or bacteriological. The evil effects of heat and humidity upon the human organism are universally recognized. Dust particles injure the throat and lungs and play an important part in predisposing to tuberculosis. Bad lighting exerts an obviously harmful effect upon the eyes. Hence the Committee believes that determinations of temperature, humidity, dust and intensity of light should be fundamental in all sanitary investigations. Standard procedures are recommended for all four of these tests.

Chemical determinations of carbon dioxid in the air, while historically of supreme importance, are held by the Committee to furnish less direct evidence of unfavorable hygienic conditions than do the tests for temperature and humidity and dust, (Gilbert, 1909; Great Britain, 1909). In combination with these latter tests they may, however, be of value, and a standard procedure is suggested. In certain special investigations the determination of the number of bacteria present in the air may also be of interest and a standard procedure is recommended for this purpose.

Other minor questions are discussed in the report, without the recommendation of standard procedures.

II. Physical Determinations.

The principal physical properties of air which it is desirable to take into consideration are temperature, humidity, pressure, dust, light and the velocity of air currents. It would be desirable to include sound and odor, but at the present time it seems impracticable to bring these two important properties of air within the range of exact observation and record.

For most practical purposes it is desirable that analyses of air should show average conditions, that is, conditions which

obtain over an appreciable period of time, as, for example, from thirty seconds to several minutes. In most cases the minute changes in the atmosphere which are constantly occurring are of small consequence to the analyst and can be neglected, except in unusually delicate researches, where special apparatus is required. Fortunately most types of physical apparatus intended for the analysis of air are adapted to register these average conditions, so that the records need no calculation to make them suitable for practical use.

The reason why average conditions are recorded is that the instruments have a lag, which makes the reading occur some time after the occurrence of the conditions which produced it. For most purposes this lag or inertia is of little consequence, but in some instruments it is so great as to be seriously objectionable. For example, some types of thermometers take 15 or 20 minutes to record the temperature when a decided change occurs. This lag may make the reading useless, where a thorough knowledge of the changes is important.

1. Temperature.

For most purposes the temperature of the air can most conveniently be determined by means of mercurial thermometers. These are made in a great variety of forms depending upon the uses to which they are to be put. An accurate and convenient form of thermometer is a naked tube with an elongated bulb of mercury at one end and a ring at the other through which a cord can be tied. The scale in degrees and fractions thereof is etched upon the glass. Thermometers of this type may possess considerable accuracy. Generally they can be relied upon to about one-half to one-fifth of one degree.

It is common to place rod thermometers upon a backing of metal, card or wood, the scale in this case not being etched upon the glass but painted upon the backing. It is perhaps unnecessary to say that thermometers of this type are often more ornamental than accurate. They usually possess a decided lag and are, for this reason, frequently unserviceable. When employed for careful air work thermometers should be suspended freely in the atmosphere or, at least, placed in a current of air sufficient to insure good ventilation about the mercury column.

Registering thermometers are of two principal types—those which record maximum and minimum temperatures and those which make a record of all the changes of temperature that occur. The latter instruments are provided with clock works which move sheets of paper under a pen by which the record is made.

The maximum and minimum thermometer is constructed so as to have a small rod of metal free to move in the tube which holds the mercury. A rising or falling column of mercury pushes the metal rod before it, but leaves the rod upon receding again. When necessary the metal rod is brought to the point of contact with the mercury by means of a small horse-shoe magnet manipulated outside of the thermometer tube. Maximum and minimum thermometers of this type are almost invariably mounted upon a backing and consequently have a considerable lag. They are, nevertheless, serviceable where fluctuations in temperature are not rapid and can be recommended for determining the highest and lowest temperatures, under such circumstances.

STANDARD METHOD FOR TEMPERATURE. For an intelligent understanding of the sanitary condition of any room, car or other enclosed space neither single determinations nor maximum and minimum records are sufficient. Recording thermometers should be used, placed at various selected points and records should be obtained covering a period of several days. Such instruments are of several types. Instead of mercury the contracting and expanding medium is some rigid metal or combination of metals whose contraction and expansion causes a pen point to bear over a moving paper scale and so leave an ink trace. The clock work is generally wound up for a week, for which period the paper scale is also adapted. Scales for recording thermometers are of two principal types—those which are printed upon circular discs of paper, the rising and falling temperatures being recorded by a line which moves at a greater or less distance from the centre, and those upon which the scale is approximately rectangular, with the rising and falling temperatures tracing a line which runs in the general direction of one edge of the paper. For most purposes the latter type of scale is preferable. Among the best of these instruments are those made by Jules Richard of Paris. Scales are printed in either centigrade or fahrenheit degrees. An instrument closely resembling that of Jules Richard is sold by Queen & Co. This type is suggested as a standard.

2. Humidity.

STANDARD METHOD FOR HUMIDITY. Although not always strictly accurate, especially at low temperatures, the most generally useful instrument for determining humidity is the psychrometer or wet and dry bulb thermometer. This instrument is made in several types, that employed by the United States Weather Bureau being simple, efficient and economical. The psychrometers employed by the Weather Bureau are of two principal kinds. In one case the two thermometers with their

wet and dry bulbs are whirled in a vertical plane by means of a small machine actuated by hand power. In the second, which is the most convenient for ordinary work, the thermometers are provided with a suitable handle by which the apparatus is whirled about by the hand of the investigator. The instrument suggested as standard is of the latter (1908) type modified slightly by Soper. It consists of two mercurial thermometers 24 centimeters long, graduated from —10 to 125 degrees Fahrenheit, fastened upon an aluminum back, 1.5 cm. apart center to center. The bulbs project beyond the aluminum back for 5 cm., one of the bulbs being covered with cloth. The upper end of the aluminum back is connected by two loose wire links with a substantial handle by which it can be whirled. The whole is carried in a cylindrical aluminum case. This instrument may be obtained from Schneider Bros., 265 Green St., N. Y., or from Queen & Co. The manner of use is fully described in Bulletin No. 235 of the U. S. Weather Bureau, which contains the full tables necessary for calculating humidity from the wet and dry bulb readings, and is also described in Ward's Meteorology (Ward, 1899).

Stationary wet and dry bulb thermometers mounted, as commonly seen, with a heavy backing are not suitable for the determination of relative humidity, owing to their lag and the likelihood that the wet bulb will not be suitably moistened or ventilated.

The hair hygrometer whose action depends upon the extension and contraction of a suitably prepared hair under the influence of moisture can be made an accurate instrument; and some types are arranged for continuous record. Certain forms of the instrument are open to the same objection which has been raised against thermometers which have a backing; there is difficulty in causing a sufficient current of air to come in contact with them.

3. Dust.

The simplest and one of the most useful methods of determining the amount of dust and its composition is by means of suitable receptacles, such as Petri dishes, upon which the dust is allowed to settle for a sufficient period of time to enable a considerable quantity to accumulate. Particles are then examined under a microscope, or, if desired, they can be swept by means of a camel's hair brush upon a watch glass and weighed.

It is a practicable and desirable procedure to filter air through cotton filters or filters of other material, the quantity of air being measured either by means of a gas meter or other device. Whatever the filtering medium the quantity of air should be large, in order that the quantity of dust may be appreciable in amount and fairly representative in quality. By weighing the filtering

material before and after passing the air through it the aggregate weight of dust in the quantity of air taken for examination can be determined. It is necessary, in most cases, to guard against increase in weight of the filtering material through the absorption of water. This can be done by placing the filtering material in a desiccator before and after filtration and just before weighing in each case.

Standard Method for Dust Determinations in Ordinary Air. For very careful work the number of dust particles in the atmosphere can be determined by an instrument invented by Professor John Aitken and called a dust counter. This instrument is expensive; and a somewhat smaller but more generally useful instrument, devised also by Aitken, and called the Koniscope is recommended for standard determinations. The dust counter and koniscope operate upon the principle that dust particles form nuclei upon which moisture condenses and precipitates from a saturated atmosphere. In the dust counter the droplets are counted, in the koniscope the opacity of cloud is estimated. There are not, apparently, many cases in which the dust counter can be turned to practical account in sanitary investigations.

The Koniscope consists of two brass tubes connected at right angles and suitably fitted with stopcocks and a small air pump. By exhausting the air from one of the tubes, allowing the space to become saturated with water vapor by evaporation from wet blotting paper within, and then allowing this moisture to condense upon the dusty astmophere under examination, clouds of different degrees of density can be formed inside the tube. The density of the clouds can approximately be measured by looking through the tube from one end to the other, windows being provided for this purpose. A table is supplied with the instrument to give the approximate number of dust particles corresponding to clouds of different degree of density.

The koniscope can be obtained from Queen & Co. This instrument is easily handled and sufficiently delicate to merit wider use than has yet been made of it in sanitary investigations. It is capable of detecting with great delicacy different currents of air, where the only difference between them lies in the number of dust particles present.

Standard Method for Dust Determinations in Air Heavily Laden With Dust Particles. One of the principal objections to filtration methods in studying the dust in ordinary air lies in the fact that enormous volumes of air must be filtered in order to obtain appreciable results. In factories and other places where the dust is thick the following method is recommended. A measured volume of air is drawn through a filter of granulated sugar, and the sugar is dissolved and the dust suspended in a measured volume of distilled water. The volume taken must vary with the amount of dust present in the air. The sugar should be of the ordinary granulated type with grains between .25 and 1.00 mm. in diameter. The layer of sugar should be 1 cm. deep and may be held in place in a glass tube of 1 or 2 cm. bore by a perforated stopper and square of bolting cloth or by a plug of cotton. The air sample should be collected rather rapidly; for heavily laden air a suction cylinder of metal with a closely fitting piston may be used. Where larger volumes of air are to be examined a Roots blower, operating on the suction principle, can be used to advantage, the quantity of air being measured by a gas meter interposed between the blower and the filter.

The weight of dust present may be determined by filtering the water in which the dust has been suspended through a Gooch crucible. The number of dust particles may be found by the following method (Winslow, 1908): After thorough agitation, one c. c. of the suspension is placed in a Sedgwick-Rafter cell and the particles are counted under the microscope by the method used in the microscopical enumeration of micro-organisms in drinking water (Whipple, 1905). The cell is 50 mm. by 20 mm. in area and 1 mm. deep and the method employed consists essentially in counting the number of particles in representative mm. squares. Both the top and bottom of the cell must be examined to get dusts lighter and heavier than water. Glassware and sugar must be clean and control determinations should be made, to detect any chance pollution.

4. Illumination.

Two general methods are available for the practical determination of the intensity of lighting. The first of these methods depends upon the distance at which print of a given size can be read by an investigator possessing average eyesight. A card of type of different sizes such as is commonly employed by oculists is taken to the point where the light is to be measured and some line of type is selected for the test. The distance at which this type must be held from the eyes in order to be legible is then measured and compared with the distance at which the same type can be seen in unobstructed daylight. The difference between the two distances is taken as a basis of difference in the strength of the illumination.

STANDARD METHOD FOR MEASURING ILLUMINATION. The second method, which is recommended as a standard procedure, depends on the use of photo-sensitive paper such as can be obtained from any dealer in photographic materials. By exposing the sensitized paper through a slot in a cardboard for a sufficient period of time and noting the number of seconds or minutes consumed to match in depth a standard shade of color the intensity of light can be determined with much accuracy. If a fresh piece of paper is exposed to the direct rays of the sun for three seconds it will assume a shade which can be used as a standard for a given series of tests. The intensity of light at other points may be compared with this by noting the number of seconds required to color a fresh piece of paper from the same lot to the same shade.

5. Velocity of Air Currents.

The velocity of strong air currents is customarily measured by means of recording anemometers. There are so many of these instruments on the market and their use is so generally understood that it seems unnecessary to describe them. Anemometers require a considerable velocity of air and they should never be used without a carefully prepared table of corrections whereby their readings can be adjusted.

It often becomes desirable in sanitary investigations, particularly in studies of ventilation, to determine the strength and direction of currents of air which are too delicate to be measured by means of anemometers. Lighted candles have sometimes been used to show the direction of such delicate air currents, the flame being deflected in the direction in which the current is moving. More delicate than this is the method of noting the course taken by the smoke from a joss stick, cigarette or cigar. For a further discussion of the study of air currents reference may be made to Shaw (1907).

6. Notes on Physical Determinations.

Physical observations of the atmosphere to be of value must not only be made with accuracy and with instruments suitable to the particular tests made, but the observations should be sufficiently numerous to indicate representative or, at least, average conditions at the place under inquiry. One determination of temperature or humidity, for example, is of little service unless it is known that the circumstances under which that determination was made frequently occur. No instrument, of course, is mathematically exact. Each has its error and it is important to learn its error and allow for it whenever failure to do so would affect the value of the results desired. The difficulties of adjustment and uncertainty of results obtained with very delicate apparatus in the hands of unskilled workers make the recommendation of the most refined instruments seem unwise in this place, where practical rather than ultra-scientific methods are desirable.

It is important in using any of the physical instruments referred to here that their accuracy be not over-rated. All instruments employed in sanitary investigations should be thoroughly understood by the investigator using them, and where any considerable importance attaches to the results the instruments should be standardized. To standardize an instrument is to compare it with some other instrument whose accuracy has been demonstrated and its error known. An extensive investigation should be carried on by the help of a special testing station, where all the instruments can be standardized and examined from time to time by a person especially assigned to this work.

In the absence of a testing station or other convenient means of standardizing instruments, apparatus for the physical examination of air can be sent to the Bureau of Standards, Washington, D. C. At that Bureau examinations can be made of thermometers and other instruments and the results reported upon at a nominal cost. Every laboratory and sanitary worker should have a few instruments which have been tested by this or some other laboratory and can be depended upon as accurate enough to be used for comparison.

III. Chemical Determinations.

1. Laboratory Methods for Determining Carbon Dioxide with a High Degree of Accuracy.

Numerous efforts have been made to develop methods of analyzing air for carbon dioxide, applicable to the varying conditions under which the chemist, sanitary engineer or inspector must work. The chemist is called upon to make exceedingly accurate, careful analyses for scientific purposes, while the inspector and engineer are called upon to make estimates and comparisons. It is plain that no one system or method will satisfactorily meet the requirements of all these conditions and therefore in preparing a description of the most satisfactory processes for use as standard methods, the available methods have been classed either as accurate methods or as general tests.

For accurate, scientific work, say, when accuracy to 1-10 of a part per ten thousand is required, the committee recommends as the standard the Patterson apparatus as modified by Sondén, one form of which has been used by Dr. F. G. Benedict of the Carnegie Nutrition Laboratory for over a year, with the greatest satisfaction.*

This apparatus measures a given volume of air, and absorbs the contained carbon dioxide in potassium hydroxide, afterward accurately measuring the remainder, thus giving the carbon dioxide present by volume. The air is measured in all cases at the same pressure and temperature and is measured accurately by means of the readings on a very finely graduated capillary. The principle is simple, but accurate operation requires considerable technique.

*This apparatus will shortly be described in print by Dr. Benedict.

The apparatus may be had by applying to Sondén in Stockholm at a cost of something less than one hundred dollars.

For accurate inspection work, say, one-quarter of a part per ten thousand, the Eimer and Amend form of the Petterson Palmquist apparatus is recommended. This is very similar to the Sondén form but not as delicate. Its cost is about fifty-five dollars.

2. Practical Methods of Determining Carbon Dioxide for Sanitary Purposes.

The time method of Cohen and Appleyard (1894), is recommended as combining practicability and reasonable accuracy in a degree suitable for practical sanitary work.

STANDARD METHOD FOR CARBON DIOXIDE. If a dilute solution of lime water, slightly colored with phenolphthalein, is brought in contact with air containing more than enough CO_2 to combine with all the lime present, the solution will be gradually decolorized, the length of time required depending upon the amount of CO_2 present. The quantity of lime water and volume of air remaining the same, the rate of decolorization varies inversely with amount of carbon dioxide. The method is scientific in principle because it recognizes the fact that the absorption of CO_2 by Ca or Ba hydroxide solution is a time reaction.

Collect samples of air in one-half liter glass-stoppered bottles by any of the methods of collection. Run in 10 cc. standard lime water, replace stopper, and note time. Shake bottle vigorously with both hands until color disappears. Note time required, and ascertain corresponding amount of CO_2 from table.

TABLE.

Time in Minutes to Decolorize Solution	CO_2 per 10,000	Time in Minutes to Decolorize Solution	CO_2 per 10,000
1¼	16.0	3½	6.0
1⅓	13.8	4	5.3
1½	12.8	4¼	5.1
2	12.0	5	4.6
2¼	11.5	5¼	4.4
2¾	8.6	6¼	4.2
3¼	7.7	7½	3.5

3. Rough Methods of Determining Carbon Dioxide.

For the sake of completeness a brief description of the shaker methods of determining carbon dioxide is here included, although their accuracy is not such as to warrant the committee in recommending their use.

The volume of air that must be brought into contact with a definite quantity of lime water, in order to neutralize all the lime, is taken as a measure of the CO_2 in the air. The quantity of lime water and the time of reaction remaining constant, the amount of CO_2 varies inversely as the volume of air. The apparatus consists of graduated shakers either Wolpert or Fitz, and a pipette for measuring 10 c. c. of lime water.

Be sure the plunger of the shaker slides easily, then remove and run into the tube 10 c. c. of the lime water solution. Introduce the plunger, and press it to the top of the solution, then withdraw it to the higher graduation. Close the mouth of the small tube in the Fitz, or the stem of the plunger in the Wolpert with the finger and shake vigorously for 30 seconds. The volume of air brought in contact with the solution is 50 c. c. in the Fitz and 40 c. c. in the Wolpert. Remove finger closing small end, press inner tube or plunger again to top of solution in Wolpert or to T in Fitz, and draw it up as before, thus admitting 20 c. c. fresh air in the Fitz and 40 in the Wolpert. Shake for 30 seconds. Repeat until color is discharged. The first trial will probably give the approximate result, and subsequent tests will aid in giving the correct one. From the volume of air used, the amount of CO_2 can be determined from the table.

TABLE.

Air in cc. Used	CO_2 per 10,000	Air in cc. Used	CO_2 per 10,000
30	28	91	9 bad
36	22	103	8
46	18 very bad	117	7
58	14	138	6
69	12	165	5 good
82	10	207	4

Stoppers and vials should be washed and dried and kept separate and parts of the shaker should be kept separate. In using the shaker see that the fingers are clean. Take care to avoid loss of liquid on addition of fresh air.

4. Methods of Collection.

In the case of the Cohen and Appleyard Method.

Fully as important as the actual test is the method of collecting the sample. For this the committee recommends as standard for more accurate work, the method of collection by water siphon.

STANDARD METHOD OF COLLECTION. The Water Siphon Method. Two bottles (diameter one-third the height), volume about one-half litre, of nearly equal capacity should be fitted with rubber stoppers carrying small glass tubing connected by several feet of rubber connector, with clamps. Fill one bottle completely with water, nearly free from carbon dioxide.

The pair of bottles is taken to the place from which the air is to be collected. The inlet tube may be long to reach to near the ceiling, or short; if long, the first siphoning should be rejected, to secure filling the inlet tube with the air desired, the stoppers exchanged, and the sample taken. The air-filled bottle should be stoppered and taken to the laboratory; or the test solution at once added, and the bottle stoppered and shaken, noting minutes and seconds. One bottle of water with a small reserve will serve for a number of takings before absorbing a deleterious amount of CO_2.

The Steam Vacuum Method may be used as an alternative in less accurate work. The steam is supplied by a 500 c. c. flask serving as a boiler, with a bunsen burner to apply the heat. The flask should be fitted with a rubber stopper carrying a No. 6 glass tube so arranged that one end extends within ½ inch of the bottom of the bottle when placed in position on the stand. The bottles should be of about 500 c. c. capacity, made for a ground-glass stopper but fitted with a rubber stopper.

To prepare the jet, the water in the flask should boil for five minutes in order to expel completely the air in the water and the flask. The pressure should be sufficient to throw the vaporized steam at least 1 foot above the exposed end of the tube.

Place the empty bottle on the stand in an inverted position and allow to remain for three minutes. In the meantime apply a thin coating of vaseline half way up the sides of the stopper. The vaseline acts as an unguent, reducing the coefficient of friction to such an extent that the principal resistance is due to the reaction of the stopper against compression. This enables one

to force the stopper in far enough to bring the glass and rubber into intimate contact, which is essential. The vaseline also fills the interstices between the rubber and the glass, so as to make leakage impossible.

Protecting the hand with a cloth, raise the bottle from the stand, and the instant it clears the end of the tube insert the stopper while the bottle is still inverted. The stopper may be pushed in more securely by pushing it against the table with a few pounds pressure while the bottle is still in the inverted position. Keep the stopper in under this pressure for a few minutes until the vacuum begins to form, after which the atmospheric pressure will keep it in place.

All the bottles required are treated in the same way. The rubber stopper should be at least one size larger than would ordinarily be used for the bottle, and should project three-eighths of an inch or more so as to be easily removed when the sample is to be taken.

Sample bottles may be tested for completeness of vacuum by holding them in an inverted position under water at 70° F., and removing the stopper. After the water has replaced the vacuum, the stopper is inserted and the bottle removed.

5. Solutions.

Standard Lime Water for General Tests. To a litre of distilled water add 2.5 cc. of phenolphthalein (made by dissolving .7 grams of phenolphthalein in 50 cc. of alcohol and adding an equal volume of water). Stand the bottle of water on a piece of white paper and add drop by drop saturated lime water till a faint color persists for a full minute. Now add 6.3 cc. of saturated lime water and quickly cork the bottle, or connect the pipette.

IV. Bacteriological Determinations.

The determination of the number of bacteria in air seems to the Committee to have less importance than was once believed. Disease spread through air is probably due most often to direct pollution with spray from the mouth; and it does not seem possible to measure such pollution in a quantitative way. The total number of saprophytic bacteria often corresponds with the amount of dust present. This is especially true when the dust is not of metallic or other industrial origin. In the examination of the air of barns, dairies, theatres, factories and streets bacterial data may prove of value.

1. Quantitative Determinations: A large number of different pieces of apparatus have been devised which are, after all, simply adaptations of three general methods, viz.:

(a) Filtration of air; (b) Bubbling air through some liquid medium; (c) Precipitating the bacteria from a given volume of air. While each of these methods can be made to give fairly satisfactory quantitative data in the hands of competent workers, nevertheless the committee is of the opinion that the time has arrived when one of them should be adopted as a standard and the others preferably dropped. In adopting a method as standard, the following principles should govern the selection:

(a) Simplicity and inexpensiveness of apparatus.
(b) Ease of operation.
(c) Universal applicability.

Basing judgment upon these considerations and upon numerous comparative tests made for the purpose, (Weinzirl and Fos), the Committee is of the opinion that the filtration method comes nearer to the ideal than either of the other two, and, therefore, that it should be adopted as standard. The apparatus and procedure is described as follows:

Standard Method for Enumerating Bacteria in Air. (Filtration method of Petri). The filter tubes are glass tubes 1½ cm. in diameter and 10 cm. long. In the end of each is placed a perforated cork stopper through which a glass tube 6 mm. in diameter is passed. The filter consists of a layer of sand which has been passed through a 100 mesh sieve, 1 cm. deep supported by a layer of bolting cloth covering the cork. Two filter tubes are connected in tandem and a measured volume of air, 10 litres or more, is drawn through at a constant rate by suction. The suction is applied by means of an aspirator of known volume, preferably one of the double or continuous type. Either the Aspirator, Magnus (No. 12,210, $7.50–$9.00), or the Double Aspirator (No. 12,212, $20–$25), both made by Bausch and Lomb are suitable for this purpose. Before using a pair of filter tubes, a test for possible leakage is made by placing the thumb over the cotton stopper and applying the aspirator; if the suction is weak or absent, the corks must be tightened or the tubes discarded. All corks should be tightened and connections wired immediately before using the filters. The collection of the sample should take from 1 to 2 minutes, per liter.

After filtering a definite volume of air through the tubes, the sand is shaken out into 10 cc. of sterile water, thoroughly shaken and aliquot portions plated in ordinary nutrient agar, all plates being made in duplicate. The plates are incubated at room temperature for five days, when final counts are made. If petri dishes 9 cm. in diameter are employed, all plates showing a larger count than 200 colonies should be rejected to eliminate inhibitive action.

A rough idea of the bacterial content of the air may be obtained by the method of exposing plates for definite periods of time and counting the colonies which develop from the germs falling upon them. This procedure is not, however, recommended by the Committee on account of the fact that results are notably affected by varying environmental conditions and are not related to any specific volume of air.

2. Qualitative Determinations: In the study of the bacteriology of sewer air the colon bacillus and the sewage streptococcus may conveniently be used as indices of contamination. Samples may be collected as for the quantitative determination and, after incubating the filtering sand in dextrose broth, must be kept for at least a week and examined daily after three days. Any streptococcus producing a faint growth on agar and coagulating milk may be considered as of human origin.

Gordon (1904) has suggested the use of the similar streptococci found in the mouth as indices of pollution by mouth spray. Your committee (Winslow and Robinson, 1909) has been unable to find such organisms in the air, even under extreme conditions, in sufficient numbers to warrant the recommendation of this test.

C.-E. A. Winslow, Chairman.
Ellen H. Richards,
G. A. Soper,
J. Bosley Thomas,
John Weinzirl.

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REPORT OF COMMITTEE ON STANDARD METHODS FOR CHEMICAL ANALYSIS OF WATER AND SEWAGE.

The Committee begs to present the following report of its work during the past year.

The Committee has made an extensive study of the various methods now in use for the so-called mineral analysis of water. For this purpose samples of a western water rather high in mineral constituents was submitted to about fifteen different laboratories for a complete mineral analysis. It was hoped in this way to establish a basis of procedure which would be satisfactory and accurate. The results, however, have merely demonstrated the unsatisfactory conditions of this branch of water analysis at the present time and the need for a more thorough study of the various determinations. The committee feels therefore that it is not in a position to recommend a definite set of procedures at the present time. It is further recommended that a tentative scheme for analysis be prepared after full consultation with the various workers interested and that the merit of this scheme be again submitted to a practical co-operative test as was done in the first instance. It is believed that a final report can be prepared in time for the next annual meeting. The question of the determination of nitrites in both water and sewage has also been the subject of investigation by three members of the committee. Upon this point also the results are not as yet conclusive and further time must be asked for to complete the work.

At the present time the Committee recommends the adoption of the following changes in the present text of the standard methods report:

1. A complete index to the volume should be prepared. At the head of each page the determinations dealt with on that page should be indicated in the place of the present page headings which serve no useful purpose. This change will greatly facilitate the location of any particular determination without reference to the index.

2. On page 15, omit the words "and microscopical" as it is not believed that samples for microscopical examination can be satisfactorily preserved by disinfectants.

3. On page 16 "Preparation of Silica Standard." It is recommended that precipitated fuller's earth be used in place of diatomacous earth now called for.

4. On page 21, line 19, omit the words "To the Graduation Mark" and substitute the words "to the height equal to that in standard tubes."

5. Page 23, last line. Substitute "Contributary" for "Decisive."

6. Page 26, omit the paragraph beginning "Where they are tabulated together," as it is believed that the addition of non-significant ciphers at the right of significant figures gives as misleading an idea of the accuracy of a number as if digits were used.

7. On page 28, line 25, substitute "5 cc" for "3 cc" and follow this paragraph by the following: "A blank determination shall in all cases be carried out under the exact conditions of the actual determination except that distilled water is used. The actual standardization of the permanganate against the oxalate gives the true strength of the former. The blank gives the relative strength of the two solutions under the conditions of the test. The amount of permanganate used in the determination minus the blank is the amount actually reduced by the organic matter.

8. Page 31, line 15. Omit the words "perhaps 10% on an average" as it is believed upon experimental evidence that this figure is entirely too large.

9. Page 31, line 28, change the paragraph to read "For waters low in free ammonia procedure A shall be followed."

10. Page 34, after Table 6, add the following paragraph: "While the numbers given in the table above serve a useful purpose in indicating the approximate amounts of the two solutions to be employed it is found desirable to make an actual comparison of the standards thus prepared with carefully prepared ammonia standards. Only in this way can the personal equation of the analyst and slight difference in the quality of the Nessler solution be properly compensated. This compari-

son shall be made at rather frequent intervals to assure the permanence of the standards and shall always be checked by each analyst using these standards.

11. Page 38, line 3. Substitute the phrase "which shall be collected" for the present phrase "which if desired may be collected."

12. Page 38, line 16. Add to this sentence after the word "sample" the following clause "and to determine the free ammonia in the distillate." After this paragraph add the following paragraphs:

"The following procedure may be substituted for the above: Determine the free ammonia by direct Nesslerization as described on page 35, and determine the sum of the free ammonia plus the organic nitrogen as described above but without preliminary distillation. The organic nitrogen will then be the difference between the value thus obtained and the free ammonia value."

"It is not consistent to determine the free ammonia by the direct process and on another sample the organic nitrogen after distillation, since by such a procedure a certain amount of nitrogen present in easily broken down compounds will escape detection."

13. Page 39, after Reagent No. 4, add: "No. 5. Fuchsine reagent. A solution containing about 0.1 gram Fuchsine per litre." Also at the end of the procedure the following paragraph: "The nitrite standards made up as described above and allowed to stand ten minutes may as an expedient in routine work be matched by eye by diluting the Fuchsine solution to the required depth of color. For waters high in nitrites and for all sewage work those Fuchsine standards have been found to be sufficiently accurate. A slight error is introduced due to the effect of temperature upon the rate of color production. They are reasonably permanent if kept out of the bright sunlight but should be checked at least once a month against freshly prepared nitrite standard. It has been found in practice that they are more permanent than dilute nitrate standard usually employed."

14. Page 41, last line; after word "water" insert "add several strips of aluminum foil allowing the action to go on over night."

15. Page 44, line 7. Substitute "tared" for "tarred."

16. Page 52, Procedure for Copper only; substitute the following method:

APPARATUS. Platinum dishes of about 100 cc. capacity to serve as anodes. Connection with the circuit is most conveniently made by placing the dish in a little mercury, contained in a shallow metal dish. To the latter is soldered a wire leading to the positive binding post.

A stout platinum wire, about 50 cm. long, 40 cm. of which is coiled into a flat spiral and whose end is fastened directly to the negative binding post. The spiral constitutes the cathode.

A convenient source of electrical current. The character of the current is not so important in this case as in gravimetric processes, since only small amounts of copper are dealt with and the deposit need not be washed or dried. Two "gravity cells" in series, yielding a current through the solution of about 0.02 ampere are satisfactory.

Nessler jars of the short type holding 100 cc.

REAGENTS. Standard copper solution. About 0.8 gram of clean copper sulphate crystals are dissolved in water and, after the addition of 1 cc. concentrated sulphuric acid, the volume is made up to one liter. In 100 cc. of this solution the copper is determined in the usual way by electrolytic deposition and weighing and the solution is diluted so that 1 cc. containing 0.2 milligram copper. This solution is permanent.

Potassium sulphide reagent. An alkaline solution of potassium sulphide made by mixing equal volumes of 10 per cent. potassium hydroxide solution, and a saturated solution of hydrogen sulphide in water.

Nitric acid one to three and sulphuric acid one to one, both tested for copper.

THE DETERMINATION. Of waters carrying from 0.1 to 1.0 part copper one litre is taken. For other concentrations take proportionate amounts. Evaporate to about 75 cc. and wash into the platinum dish. Add 2 cc. of the dilute H_2SO_4 for clear and soft waters. For alkaline waters an additional amount is used to offset the alkalinity. For waters carrying much organic matter or clay, 5 cc. of acid are added to assure the formation of a soluble copper salt. The dish is then placed in position, the

cathode suspended in the solution so that it is parallel to and about half an inch from the bottom, and the circuit is closed. Electrolyze for about four hours with occasional stirring, or over night, if convenient. Lift out the cathode without previously having opened the circuit, and immerse the spiral in a small amount of the dilute nitric acid, previously heated to boiling. Wash off the wire and evaporate the nitric acid solution to dryness on the water-bath. If silver is suspected to be present, add a few drops of hydrochloric acid before evaporation. Take up in water and wash into the Nessler jar. Make up to the mark and add 10 cc. of the sulphide reagent. The color of the copper sulphide develops at once and is fairly permanent, lasting for several hours, at least. A similar tube is prepared by adding 10 cc. of the reagent to a tube of distilled water and then adding standard copper solution in 0.2 cc. portions until the colors of the two tubes match. If one litre of water were originally taken, each cubic centimeter of standard solution used represents 0.2 part per million of copper.

17. Page 59, line 11: "Measure 100 cc. of the water into a 200 cc. graduated flask, add exactly enough $\frac{n}{50}$ sulphuric acid solution to make the water neutral to methyl orange. If a blank determination is made that portion of the water used in the determination of the alkalinity (see page 61) may be used. Boil down a volume of about 30 or 40 cc. to expel carbonic acid and to concentrate the solution. Introduce by means of a pipette 25 cc. of a clear saturated solution of lime water into the test solution and into a blank. Fill with boiled distilled water to about 2 cc. above the 200 cc. mark, mix well, stopper immediately, and cool. When cool titrate an aliquot portion of each solution (which may be obtained by decantation or filtration) with fiftieth normal sulphuric acid using phonolphthalein as an indicator. The difference between the test solution and the blank is equivalent to the magnesium in the original water.

Remark: By adopting this procedure the test solution and the blank are treated in exactly the same manner and the chances are that errors are greatly reduced.

18. Page 62, line 12, omit the words "It is not a reversible indicator, that is".

19. Page 64, lines 29 and 30: page 65, lines 1 and 17, page 66, lines 12, 17 and 20: change "incrustants" to "mineral-acid hardness."

Page 65, line 20: Change "incrusting constituents" to "mineral-acid hardness."

20. Page 66, line 2: "If a blank determination is made the difference between the number of cubic centimeters of sulphuric acid used in the blank and the test gives the mineral acid hardness directly. When the number of cc. used in the tests exceeds the number used in the blank carbonates of sodium or potassium are indicated."

21. Page 67, line 25: "A satisfactory end point cannot be obtained when more than 8 to 10 cc. of the $AgNO_3$ solution is required. Therefore when there are more than 800 to 1000 parts per million of chlorine present and accurate determinations are desired, it is recommended that the chlorine be determined gravimetrically.

Determination of bromine and iodine.* For the quantitative determination of bromine the mixture of evaporated salts is placed in a flask of 250 cc. capacity with 40 grams of potassium dichromate and enough water to make 100 cc. taking the water in which the halogens were first dissolved. The flask is provided with a dropping funnel through which water may be added to keep the volume of solution above 2-3 and not more than the original amount. The flask is also connected to a vertical condenser which condenses the steam and halogens vapors. The haolgens vapors are received at the lower end of the condenser in a 5% solution of potassium iodide. After the mixture has been boiled and the iodine is all distilled 8 cc. of sulphuric acid (equal volume of sulphuric acid and water) is added through the dropping funnel and the mixture is again distilled until bromine no longer comes over. The iodine distilled over and the iodine set free by the bromine which was distilled over are each titrated with $\frac{n}{100}$ thiosulphate solution and the iodine and bromine calculated from the amount used.

* Journal of British Chemical Society, Vol. 49, pp. 682, M. Dechan, also University Geological Survey of Kansas, Vol. 7, pp. 90.

22. Page 72, line 1, omit the words "Because as already explained it is not reversible and indicates only on the alkaline side of the neutral point."

23. Page 73, "Half-bound and bound carbonic acid." It has been found in practice that those terms are misleading and unsatisfactory. It is recommended that the carbonic acid be reported as "free carbonic acid", "carbonic acid as bicarbonates" and "carbonic acid as normal carbonates." This change would involve the following change in the text: Under "Half-bound Carbonic Acid," which heading will now be "Carbonic Acid as Bicarbonates," the text will read: "When the water is acid to plenolphthalein, the carbonic acid as bicarbonates is equal to 88% of the alkalinity when the latter is expressed in terms of calcium carbonate." The third paragraph "Carbonic acid as bicarbonates is present only when the alkalinity by phenolphthalein is less than ½ of that by lacmoid or erythrosine. Then twice the number of ccs. of $\frac{n}{50}$ sulphuric acid required when phenolphthalein is used, subtracted from the number of ccs. of $\frac{n}{50}$ acid used in determining the alkalinity of 100 ccs. of the water with lacmoid or erythrosine (see Page 61) multiplied by 8.8 gives in parts per million the carbonic acid as bicarbonates." Under the heading "Bound Carbonic Acid" which will now be changed to "Carbonic Acid as Normal Carbonates" the procedure will read: "Compute this in parts per million of CO_2 as 44% of the alkalinity by lacmoid or erythrosine expressed in terms of calcium carbonate (see page 61) minus one-half the CO_2 previously determined as bi-carbonates."

24. Page 75. After the first paragraph: "For routine work with waters high in dissolved oxygen it is sufficiently accurate and may be more convenient to pipette 50 cc. of the well shaken sample and titrate as above. Four times the number of cubic centimeters used in titrating gives the oxygen in parts per million.

25. Page 78, omit the procedure here outlined and substitute the following:

"Samples should be collected in glass-stoppered bottles of 150 or 200 cubic centimeters capacity. No special precautions are necessary in collecting samples of ordinarily good effluents that are fairly high in dissolved oxygen. If the dissolved oxygen

is low, precautions similar to those used in collecting dissolved oxygen samples should be observed. A one-tenth per cent. solution of methylene blue, preferably Merck's double zinc salt, is used as indicator. One-half cubic centimeter of this solution is added to each of the samples, which are then incubated, preferably at 20 degrees C., for four days, and observations are made at least once a day. If quick results are desirable the incubation may be made at 37 degrees by adopting suitable precautions to prevent the loss of dissolved oxygen. For this purpose the sample is taken in a bottle fitted with a rubber stopper through which an ordinary medicine dropper is introduced by half its length. Before inserting the stopper into the filled bottle the bulb of the medicine dropper is compressed. As the solution warms up this bulb takes care of the additional volume necessary and prevents the loss of dissolved oxygen. The samples in which the methylene blue becomes decolorized are recorded as having a relative stability corresponding to the time required for reduction, as given below. Those that are blue at the end of four days are given a relative stability value of 95. For more accurate work a longer period of incubation is recommended.

The following table gives the relation between the time of reduction at both 20 degrees and 37 degrees and the relative stability number.

Relative Stability Numbers.

t20	t37	s	t20	t37	s
0.5	...	11	8.0	4.0	84
1.0	0.5	21	9.0	4.5	87
1.5	...	30	10.0	5.0	90
2.0	1.0	37	11.0	5.5	92
2.5	...	44	12.0	6.0	94
3.0	1.5	50	13.0	6.5	95
4.0	2.0	60	14.0	7.0	96
5.0	2.5	68	16.0	8.0	97
6.0	3.0	75	18.0	9.0	98
7.0	3.5	80	20.0	10.0	99

s—Relative stability or ratio of available oxygen to oxygen required for equilibrium. Expressed in per cent.

t20—Time in days to decolorize methylene blue at 20° C.

t37—Time to decolorize at 37° C.

Theoretical relation—

$$s = 100\ (1-0.794^{t20})$$
$$= 100\ (1-0.630^{t37})$$

A relative stability of 75 per cent. means that the effluent in question contains a supply of available oxygen equal to 75% of the amount of oxygen which the effluent will eventually require before it will have become perfectly stable. The amount of this available oxygen is estimated fairly well by the chemical determination of dissolved oxygen and nitrates. The nitrites are usually so low that they are negligible, and it is unnecessary to decide whether or not the nitrates represent available oxygen, because they have been included in the test and must be considered in the interpretation. Undoubtedly the nitrates will not be used in the stream until the dissolved oxygen of the water has been reduced to a low point. Nevertheless, the fact remains that the available oxygen in the effluent, including the nitrates, is 75 per cent. of that required for equilibrium, and that the remainder must come from the water of the stream, which must also supply enough additional oxygen to replace that which may be abstracted from the nitrates of the effluent, if aerobic conditions are to be maintained. Analyses of water from the stream and estimates of the relative volumes of the stream and the effluent complete the data necessary for a full interpretation.

In general, effluents having a relative stability greater than 90% may be discharged into any stream without danger of their consuming any of the oxygen of the water, because effluents of such high stability will retain oxygen indefinitely on exposure to the air.

For sewages and effluents which have a very low relative stability this test may be employed for another purpose, namely to determine the actual strength of the putrescible material present. For this purpose dilutions with fully aerated tap water are made. The relative proportions of sewage and water to be employed will vary in individual cases and will probably range from one part of sewage to three of water on the one hand, to one to ten on the other. After having established the proper dilution for the sewage in question samples are prepared and treated with methylene blue as already described and the time of decolorization is noted. The relative stability number corresponding to this time refers in this case not to the original sample but to the diluted mixture under investigation. A

stability of 100% would indicate that at the given dilution in a fairly good stream putrefaction would not take place. A relative stability of 50% would indicate that twice the volume of diluting water employed in the test would be necessary in the stream to render the mixture stable.

EARLE B. PHELPS, Chairman.

Franklin C. Robinson

Just as the Journal (May 25) goes to press, the sad news reaches us of the death of Dr. Robinson.

To the American Public Health Association, of which he was a past President; to this Journal, which he served as a department Editor; to the State Board of Health of Maine for which he acted as chemical expert; to Bowdoin College, with which he has for years been connected as Professor of Chemistry; and to the various other official and professional bodies with which he has been associated, his loss will be irreparable.

Broad of mind, sound in logic, careful in judgment, and wise in council, his services have been invaluable. Large hearted and generous, he has constantly and freely given of the best within him.

"To know him was to love him."

The Massachusetts Association of Boards of Health

APRIL QUARTERLY MEETING

Boston, Massachusetts

The quarterly meeting of the Association was held at the Brunswick Hotel, Boylston street, Boston, on Thurday, April 28, under the presidency of Dr Henry P. Walcott.

On the recommendation of the Executive Committee the following gentlemen were elected members of the Association:

Dr. J. R. Hobbie, Chairman of the North Adams Board of Health;

Dr. Everett M. Bowker, of the Brookline Board of Health;

William B. Foster, of the Lexington Board of Health;

Eugene D. Whitehouse, of Boston;

Dr. Willis L. Hale, of the North Attleboro Board of Health;

John F. Twombly, of Brookline;

Laurence B. Reed, of the Plymouth Board of Health;

C. Bertram Thompson, Organizing Secretary, Boston 1915;

Charles Gardner Miles, of the Brockton Board of Health;

Dr. Augustus H. Galvin, of the Salem Board of Health;

John J. McGrath, Inspector of Meats, Salem.

Dr. PALMER. Three years ago this society voted $250 for the dissemination of knowledge in regard to sex hygiene. That money has been expended. We find the work very important, and we desire to carry it on, but the funds of the society do not seem to warrant a further appropriation. Therefore it is necessary to take some other means of getting a fund rather than have the work stop. I move that a committee of three be appointed by the Chair to attempt to raise this money outside of our treasury, and that it be given into the hands of the sub-committee that now has that work in charge. I would like to say to the members present, that if they know of someone who is interested

particularly in this subject and who has the means to give for the purpose it is the sense of this meeting that it is a very worthy cause and that the money would be well spent in this way.

The PRESIDENT. I am sure I can speak for the Association in saying that few subjects of greater importance have come before it, and that the leaflets which have been prepared by this committee have been admirably prepared and have certainly served a very useful purpose.

(Dr. Palmer's motion was adopted by the Association and Drs. Palmer, Chase and Bailey appointed as members of the committee.)

DRY AIR AND ITS EFFECT ON HEALTH.

By W. E. WATT,
Principal, Graham School, Chicago, Ill.

Those diseases which we commonly call children's diseases and which most mothers suppose their children must have are by no means children's diseases. They are diseases to which all persons are subject when their powers of resistance are sufficiently low. Treat any adult as you do an infant—if you can get him to submit to it—and he will take any of the children's diseases. His resistance will become so lowered that he will succumb to the first one whose special microbe assails him.

We contract a disease when our vitality is low, when our powers of resistance are weak, when the antibodies in our system are not numerous enough to cope with the germs which gain an entrance. The impure air we are giving ourselves is the cause of this lowered vitality. We weaken ourselves as surely as does the man who saturates himself from day to day with whisky, and who throws himself in the way of tuberculosis and pneumonia. It is a wonder that so many of that class last as long as they do. But the man who works in a temperature above seventy with the air dry is committing no less a crime against his own nature than the man who takes the whisky. He saps his own strength and any microbe that goes after him may have him.

We have acquired the habit of dying without a struggle. Few put up a fight, as a rule, against the approach of death in these times. We are so fatigued with life that death comes as a relief, and we are quite ready to go. It is rare the physician who attends the man who works indoors when he comes to his last illness finds the man possessed of spirit enough to fight. He simply succumbs. He is weary of life.

We have improved our systems of heating and ventilation until we are afraid of the air. We do not permit ourselves to breathe what God has provided for our refreshment and invigoration. The child comes into the world, the offspring of weakened, nervous, partly broken-down parents. He is born

in a room from which the free air of heaven is excluded. As a rule he never gets any fresh air until he rushes madly out at the smell of it and is spanked back in again for fear he will get pneumonia.

Some mothers have found out that the babe will become strong if placed out on the porch to sleep in his carriage. But they are so lacking in reasoning power that they will not let their two-year-old child sleep out there for fear he will kick off his coverings. And so it is only the infant in arms that gets this intelligent treatment for a little while. Then he is boxed up and coddled until he is peevish, weak, aenemic, nervous, and almost ruined by breathing the air the family procures for its own destruction.

Then he is packed off to the school or the kindergarten where the air supplied is worse than that of the home. It is heated in the basement and forced dry into all the rooms at a temperature declared to be correct. The rules of the board of education call for, say, 68 degrees Fahrenheit. Any teacher who has taught in dry air two years at 68 is chilly in winter when the thermometer registers that temperature. She declares the thermometer in her room is false. She makes trouble enough so the engineer runs the heat to 70 to avoid difficulty with her. After she has had 70 in winter a few seasons she is chilly in 70. The same methods are followed, and she gets 72, then 75, then 80. I know where there are women teaching in 80 regularly and making furious complaint if the temperature falls below that figure. There are certain rooms in every "perfectly" ventilated school which do not work just right. The system is all right, of course, but those rooms are exceptions and we haven't found out just what is the matter, but the teachers who get into those rooms are pleased with the high temperature and make a fuss if it is run down any, and so the school has rooms where the temperature is much higher than the rules of the board permit. Theoretically the rooms are at 68. But in practice they are well up towards 80 at times and in certain parts of the building.

Why are some of us chilly at 70? There are two reasons. In the first place, as everyone knows, evaporation of perspiration takes place insensibly in a dry atmosphere, especially when the

temperature is up, and so a process like that of an ice machine is going on all over our skin. The other reason is less understood but none the less sound. Moisture in the air prevents rapid radiation of heat. When the air is dry we lose heat so rapidly that a chill comes over us. It is owing to the moisture in the air that we are able to live at all, for if there were none we could not make heat rapidly enough to keep alive. Tyndal said that if he could remove the moisture in the air over England for a single summer night, everything that frost could kill would be dead in the morning.

Moisture is required in the air to prevent these chills, and when we try to live in dry air we must have an additional ten degrees of heat to be warm enough, and if we are specially low in vitality we must have more than ten degrees additional. I have found by actual experiment that the well person should not have over 62 degrees of air temperature, but the air should have a humidity of over 50 per cent. I have found also by actual test that a temperature below fifty is far better than 62 if one may wear some extra clothing and exercise a little. Forty is better than fifty if we exercise a little more. My experiments seem to indicate that the lower the natural temperature, provided the person is not feeble, the better it is for mind, body, and soul.

Everyone ought to have as much heat as he wishes. When he says he is chilly his testimony should be taken. It is idle to say a certain employe is a crank and always cold. If he or she complains of chill, it is an honest complaint, and relief ought to be afforded or dangerous results may follow. But there is a way to humidify the air and lower the temperature so that all will welcome the change. They will exclaim over it with joy. They lose the headache, the catarrh, the drowsiness, the liability to err, the testiness of temper, the habit of brooding over real or imaginary injuries, when they get into right air. Right air is low in temperature and rather high in humidity in cold weather.

But far worse than being uncomfortable in hot dry air, far worse than being chilly and getting temporarily ill, is the result of living in hot dry air, for it has a deadly effect on the human body.

Let me first prove to you that the air of your school room is drier than that of the driest desert on the face of the earth.

Air at zero taken from outdoors, has less than half a grain of moisture in the cubic foot. Warm that air to 80 and it requires twenty-two times as much moisture to make it similar to natural air in humidity. This comes about because the moisture in the air, I mean true steam, for that is what it is even at zero,—the moisture in the air contracts when heated instead of expanding as does the air. It shrinks rapidly and there is created in the air a steam vacuum.

If the air as it enters the building is at 100 per cent. of saturation, when it is heated to 80, as happens in your schools sometimes perhaps by accident, but it happens,—when heated to 80 it is no longer at 100 per cent. of saturation but at one-twenty-second of that per cent., or less than 5 per cent. of saturation.

Think of it! The air in that school is at 5 per cent. of saturation on a zero day and the air that kills the hardiest cactus God sets out on the most neglected portion of his footstool,—the desert air, stands at about 28 per cent. of saturation! And your children are put into such a place to be educated!

In my school we have open air rooms the year round. We have also a lower temperature than you have in Boston. We found that a steam jet in the warmed air makes it natural and comfortable to all at ten degrees less of temperature.

In rooms of humidified air at 62 to 64 we are clear headed and feel well. When the new air was introduced it cut down the number of cases of office discipline 80 per cent.

There is less stupidity, strife, vituperation, and insanity where the air is right.

Humidified and cooler air saves one-fifth of the coal as well as adding vitality and efficiency.

We must get it into our schools, our homes, our offices, our churches, and our saloons.

The curse of bad air is the greatest public enemy. Getting rid of it is a problem easy to solve.

BOSTON AND CHICAGO DEATH RATES.

By WM. H. DAVIS, M. D.,
Vital Statistician, Boston Board of Health.

Within the last decade the death rate of Chicago has ranged between 13.62 and 15.43, while that of Boston has never been below 17.75, and at the high point was 20.82.

Why this comparatively high rate for Boston?

Is the reason to be found in the age distribution of the population, in the peculiar type of that portion of the population which is of foreign parentage and in the large number of deaths of non-residents?

Turning to the 1900 Census as the latest source of reliable populations for comparative study, I will first endeavor to show how great an influence this difference in age distribution, color, and parent nativity has upon the death rates of the two cities.

Taking first the Registration Area in which the parent nativity of decedents was reported, representing a population of over twenty million people, death rates were figured out for the following six age periods—under 5 years; 5 to 15; 15 to 25; 25 to 45; 45 to 65; and 65 years and over; both for the colored population and for the following eleven divisions of the white population: those having mothers born in the United States, in Ireland, in Germany, in England and Wales, in Canada, in Scandinavia, in Scotland, in Italy, in France, in Russia and Poland, and in other foreign countries.

Throughout this comparison those of unknown parentage have been classified with those having mothers born in the United States, and those of unknown age have been placed in the age period 25 to 45.

The death rates for these various divisions of the population of the Registration Area are shown in Table I, (p. 383).

I would especially call your attention to the very high rates of the Irish, the Italians, and the colored.

The second table (p. 384) gives the percentage composition of the population of the two cities by color, by age periods, and by birth-places of mothers—the heavy type referring to Chicago.

Notice again in this second table the comparatively high percentages in Boston of those having Irish and Italian mothers.

Multiplying the rates in the first table by the populations in Boston of each age period and of each mother nativity, a series of products is obtained. These products added together represent the number of deaths which Boston would have had in the Census Year of 1900 if the death rates of the registration area had prevailed in Boston.

Similarly for Chicago—multiplying the rates in Table I by the populations in Chicago of each age period and of each mother nativity, another series of products is obtained. These products added together represent the number of deaths which Chicago would have had in the Census Year of 1900 if the death rates of the registration area had prevailed in Chicago.

From these theoretical totals of deaths the theoretical death rates of the two cities were obtained and were as follows:

Boston, 16.64
Chicago, 14.35

With equal percentages in each division of the populations of the two cities in Table II the theoretical death rates of the two cities would have been the same. Therefore the difference between these two rates, namely 2.29 per thousand population, represents approximately the correction which should be added to Chicago's rate, for color, nativity, and age distribution whenever the rates of the two cities are compared.

Another important correction is that needed for deaths of non-residents. For example, last year in Boston there were in all 11,058 deaths, 1,304 of which were non-residents or 11.8% of all deaths; while in Chicago with total deaths of 31,300 there were only 877 deaths of non-residents or 2.8% of all deaths.

In Boston over 82% of these deaths of non-residents occurred in Hospitals and Institutions, and the deaths of non-residents actually raised Boston's death rate last year 2.10 per thousand population, so that if the non-residents had gone home to die Boston's death rate would have been 15.65 instead of 17.75; or, putting it in another way, if the deaths of non-residents had affected Chicago as much as they did Boston, Chicago's death rate would have been raised 1.71.

Assuming that these corrections were constant during the last ten years, and taking Boston as the standard, Chicago's corrected rates are shown in Table III and are indicated in the accompanying chart by the dotted line.

Brief mention may be made of three other corrections which have not been included in this table and chart, but which should not be forgotten.

First—the correction for imperfect registration of deaths. The registration of deaths in Massachusetts was known to be so complete that the Massachusetts census enumerators in 1900 made no attempt to ascertain the deaths of the census year, but in Chicago such an enumeration was made with the result that about 1700 deaths were found which had not been recorded.

Moreover, to quote from the Census:

"As the enumerators did not report more than 50% or 60% of the deaths, the presumption is strong that the omissions in the registration record were even greater than indicated."

Now is it not reasonable to suppose that, had the enumerators found all of the deaths upon the Chicago registration record, they would have found a corresponding proportion of omissions for the other 40% of the deaths. If such be the case the true number of deaths in Chicago for the Census Year was about 28,313, instead of 25,373 credited to Chicago by the local registration records, and the crude rate would have been 16.67 instead of 14.94. And adding to this the corrections already found for non-residents, age, color and parent nativities, the Chicago rate for the 1900 Census Year would have been 20.66 as compared with Boston's rate of 20.84.

Another point not to be forgotten is that Chicago had no 1905 census, so that its present population is estimated upon the increase between the census of 1890 and that of 1900. If Boston's population for 1909 had been estimated in the same way it would have been 662,065 instead of 622,970, and the death rate would have thus been lowered from 17.75 to 16.70.

Slightly in favor of Chicago, however, is the needed correction for sex distribution. This correction is about .05 per thousand population, so that the previously mentioned 1900 corrected rate of Chicago of 20.66 if corrected for sex distribution would be lowered to 20.61.

So much for the general death rates of the two cities and the necessary corrections.

Perhaps more interesting for those interested in Board of Health work would be a comparison of the death rates "from causes directly affected by sanitation and preventive medicine." For this comparison I have taken the diseases used under this heading by the Chicago Board of Health, namely: Asiatic Cholera, Consumption, Diphtheria and Croup, Diarrhoeal Diseases, Smallpox, Scarlet Fever, Malaria, Whooping Cough, Measles, Typhoid Fever and Typhus Fever.

The corrections for age distribution, color and parent nativities have been worked out exactly as were those for the general death rates—taking in the Registration Area the deaths from this group of diseases for each age period of each mother nativity, and dividing by the corresponding population, thus securing a series of death rates for this class of diseases in the Registration Area; then multiplying these rates by the corresponding populations in each city theoretical totals of deaths were obtained from which were calculated the death rates of 4.57 for Boston and 4.15 for Chicago. The difference .42 is the needed correction for color, age distribution and mother nativities. Of Boston's 1304 deaths of non-residents last year 284 or 22% belonged in this group of diseases. As it was impossible to obtain from Chicago any detailed statement as to the causes of their non-resident deaths, I have been obliged to assume that Chicago, like Boston, had 22% of their non-resident deaths in this group of diseases. Thus estimated the correction for non-residents was .37 per thousand population in favor of Boston.

The crude death rates and these corrections are shown in Table IV (p. 386), and in the accompanying chart the dotted line shows the corrected rates for Chicago, Boston being used as the standard.

Finally I wish to call your attention briefly to the infant mortality of the two cities. Any comparison of this age period must be at the best only approximate because on the one hand there is a very imperfect registration of births in Chicago—about one-half the births being recorded—and on the other hand it is well known that any census enumeration of children under one year is unreliable.

Simply for a rough comparison, however, I have plotted out the curves of infant mortality per thousand population of children under one year. For 1900 the census populations are used and for later years the estimated populations have been found by the Chicago method which in brief is to note what per cent of the whole population are children under one year in the 1890 census and again in the 1900 census and then to maintain the rate of increase or decrease in this percentage in making estimates for the succeeding years.

Table V (p. 387), gives the death rates under one year in the Registration Area and the populations of Boston and Chicago under one year by color and by birthplaces of mothers, according to the 1900 census. This table again plainly shows that most of the immigrants who die early and often choose Boston for a home while the more hardy races move on to Chicago.

Of the deaths of non-residents in Boston last year 183, or 14%, were children under one year.

Using now Boston's percentages of populations under one year as the standard, and assuming that 14% of Chicago's deaths of non-residents were under one year, corrections have been made in Chicago's curve for color, mother nativities and non-residents just as in the other charts.

The corrections for color and nativities amounted to 15.53 while that for non-residents was 912, making a total of 24.65 to be added to Chicago's crude rate.

From the corrected rates as shown by the dotted line in Table VI, it would seem that Boston had had the better of the argument during the last five years, but here as in all other calculations so far away from the last census, too great caution cannot be used in making deductions.

The following conclusions, however, can be drawn with absolute safety, that Boston's death rates are comparatively high, because of the age distribution of its population, because of the peculiar type of that portion of its population which is of foreign parentage, and because of the large number of deaths of non-residents.

TABLE I.

Death Rates in the Registration Area by Color, by Age Periods and by Birthplaces of Mothers (1900 Census).

	Under 5	5 — 14	15 — 24	25 — 44 + the Unknown	45 — 64	65 +
For Whites Only. Mothers Born In						
United States	42.96	3.67	5.02	6.94	14.56	65.90
Ireland	56.11	4.54	7.48	13.50	30.63	96.86
Germany	47.60	3.70	4.83	8.44	20.33	81.75
England and Wales	44.19	3.64	4.59	7.71	18.34	81.06
Canada	54.92	3.64	5.43	7.63	15.70	68.43
Scandinavia	36.98	3.71	5.66	8.13	16.95	67.27
Scotland	37.01	3.30	4.51	7.99	18.84	84.61
Italy	80.69	4.92	6.65	7.96	17.25	66.14
France	67.67	3.27	4.47	8.78	19.17	74.44
Russia and Poland	42.05	2.50	3.43	5.58	15.24	61.04
Other Foreign	56.60	3.00	5.39	8.62	20.21	79.97
Colored	118.54	9.76	15.61	18.72	36.71	108.64

TABLE II.

PERCENTAGE COMPOSITION OF THE POPULATIONS OF BOSTON AND CHICAGO BY COLOR, BY AGE PERIODS. AND BY BIRTHPLACES OF MOTHERS (1900 CENSUS).

	TOTALS		Under 5		5 — 14		15 — 24		25 — 44		45 — 64		65 +		Unk.	
	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.
FOR WHITES ONLY MOTHERS BORN IN United States....	30.05	26.44	3.37	3.93	5.54	6.53	5.41	5.22	9.10	7.61	5.00	2.58	1.60	.56	.033	.014
Ireland.........	31.14	12.09	2.58	.84	4.03	1.58	5.24	2.04	13.03	5.33	5.05	1.88	1.15	.40	.056	.019
Germany........	4.26	22.98	.33	1.90	.68	4.39	.73	4.26	1.64	8.36	.70	3.33	.18	.73	.003	.012
England & Wales	4.24	3.75	.34	.22	.65	.53	.67	.60	1.64	1.56	.77	.70	.16	.14	.006	.004
Canada.........	12.59	2.72	1.35	.24	2.20	.57	2.68	.62	4.84	.97	1.29	.28	.21	.04	.016	.001
Scandinavia.....	1.93	9.50	.24	1.06	.32	1.95	.31	1.58	.83	3.62	.20	1.09	.03	.19	.003	.008
Scotland........	1.84	1.42	.12	.08	.22	.18	.26	.22	.79	.61	.36	.28	.09	.05	.002	.001
Italy...........	3.65	1.57	.59	.27	.77	.37	.63	.24	1.27	.51	.35	.15	.04	.02	.001	.005
France..........	.35	.42	.02	.01	.03	.04	.05	.07	.15	.19	.08	.09	.02	.02	.001	.001
Russia & Poland.	5.19	8.70	.85	1.49	1.28	2.25	1.08	1.62	1.53	2.55	.41	.68	.04	.11	.002	.004
Other Foreign...	1.66	8.00	.18	1.05	.29	1.87	.31	1.56	.64	2.53	.20	.85	.04	.14	.002	.004
Unknown.......	.70	.57	.03	.02	.05	.04	.07	.06	.15	.18	.05	.05	.01	.01	.341	.213
COLORED.........	2.29	1.86	.17	.10	.23	.19	.41	.35	1.09	.95	.32	.23	.04	.03	.027	.009
TOTALS ..	.....	......	10.17	11.21	16.29	20.49	17.85	18.44	36.70	34.97	14.78	12.19	3.61	2.44	.493	.295

TABLE III.

DEATH RATES OF BOSTON AND CHICAGO.

Year	Death Rates		Chicago's Rate Corrected for Color, Ages, Nativities and Nonresidents
	Boston	Chicago	
1900	20.82	14.68	18.67
1901	19.90	13.88	17.87
1902	19.11	14.54	18.53
1903	18.28	15.43	19.42
1904	18.28	13.62	17.61
1905	18.49	13.67	17.66
1906	18.95	14.18	18.17
1907	19.18	15.25	19.24
1908	19.11	14.10	18.09
1909	17.75	14.07	18.06

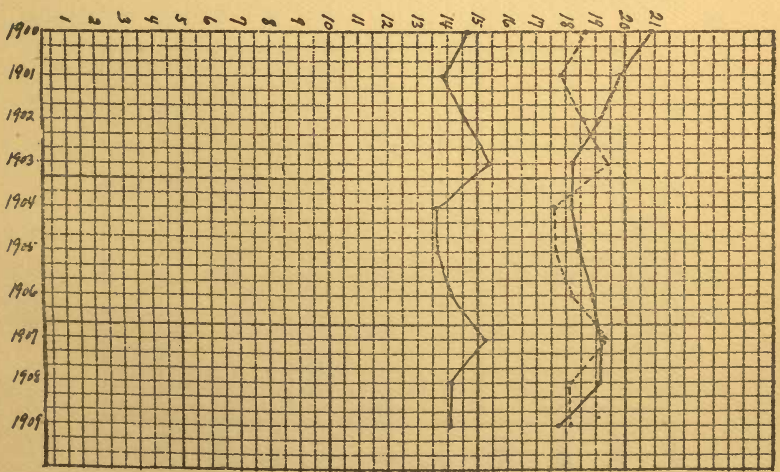


TABLE IV.

Boston and Chicago Death Rates for a Group of Diseases Directly Affected By Sanitation and Preventive Medicine.

Year	Death Rates		Chicago's Rate Corrected for Color, Ages, Nativities and Nonresidents.
	Boston	Chicago	
1900	5.46	3.96	4.75
1901	5.17	3.58	4.37
1902	4.75	3.90	4.69
1903	4.18	3.85	4.64
1904	4.09	3.31	4.10
1905	3.78	3.66	4.45
1906	3.77	3.74	4.53
1907	3.33	4.00	4.79
1908	4.16	3.89	4.68
1909	3.74	3.78	4.57

Diseases Directly Affected By Sanitation and Preventive Medicine.

Asiatic Cholera.
Consumption.
Diphtheria and Croup.
Diarrhoeal Diseases.
Smallpox.
Scarlet Fever.
Malaria.
Whooping Cough.
Measles.
Typhoid Fever.
Typhus Fever.

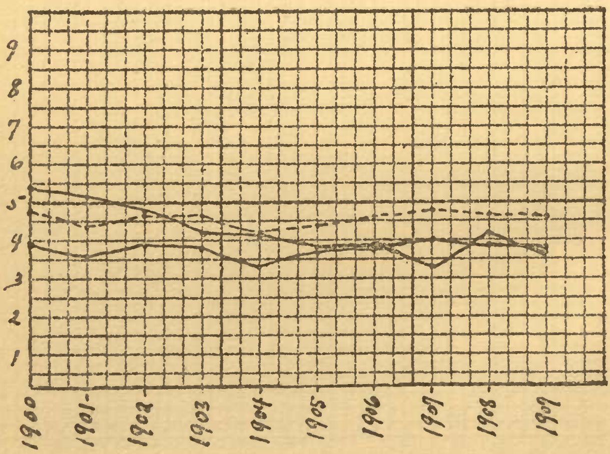


TABLE V.

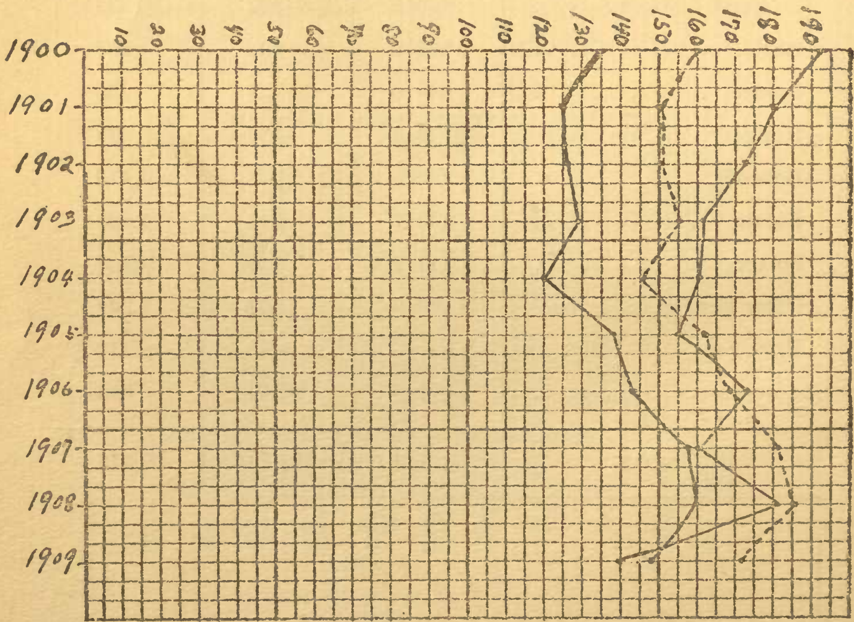
DEATH RATES UNDER ONE YEAR IN THE REGISTRATION AREA AND POPULATIONS OF BOSTON AND CHICAGO UNDER ONE YEAR BY COLOR AND BIRTHPLACES OF MOTNERS (1900 CENSUS).

Color and Birthplaces of Mothers	Under 1 Year		
	Death Rates in the Registration Area	Populations	
		Boston	Chicago
WHITES:			
United States	141.8	4,092	14,360
Ireland	169.5	3,193	2,954
Germany	159.0	366	6,039
England and Wales	149.3	395	723
Canada	183.7	1,653	834
Scandinavia	113.6	303	3,504
Scotland	120.2	122	243
Italy	189.2	843	985
France	244.9	22	50
Hungary	113.4	23	233
Bohemia	142.5	2	2,110
Russia	133.7	819	1,322
Poland	111.7	193	4,336
Other Foreign	183.0	208	1,246
Unknown	——	26	110
COLORED	371.5	213	326
TOTALS	165.4	12,473	39,375

TABLE VI.

BOSTON AND CHICAGO DEATH RATES OF CHILDREN UNDER ONE YEAR PER 1,000 POPULATION UNDER ONE YEAR.

Year	Death Rates		Chicago's Rate Corrected For Color, Nativities and Non-Residents
	Boston	Chicago	
1900	193.22	135.64	160.29
1901	179.34	125.91	150.56
1902	172.86	126.49	151.14
1903	162.59	129.54	154.19
1904	161.37	120.95	145.60
1905	156.24	138.82	163.47
1906	172.47	144.14	168.79
1907	160.60	157.22	181.87
1908	183.31	160.58	185.23
1909	139.00	147.70	172.35



DISCUSSION.

The PRESIDENT. There is no one, probably, who can discuss this paper more wisely than the representative of a great New England city, which city has had for a very long period of time an exceptionally good body of vital statistics. I will ask Dr. Chapin, of Providence, to respond.

Dr. CHAPIN. Mr. President, we have had good statistics in Providence for a long time, owing, as you well know, to my predecessor, Dr. Snow, who began his good work in 1856. I want to thank Dr. Davis for the work that he has done in analyzing these figures. It certainly represents an enormous amount of labor, and it will prove a most excellent thing for the education of the popular mind in regard to the value to be placed upon statistics as they are ordinarily published. It is customary throughout this country to give out general death rates as indicating in a very accurate manner the sanitary condition of the community from which they come, but crude death rates are absolutely worthless, as has been amply demonstrated here today. I am sure we can all appreciate the immense amount of labor that has been put into this analysis, and we cannot but feel grateful for the effort which has been made to show us in exactly what directions it is necessary to look for flaws in the argument which is based upon crude death rates. I would like very much to have had an opportunity to have studied this paper and to have discussed some of the points in detail. We have heard a great deal about the low death rate of western cities as indicating a healthy population, and oftentimes as indicating an efficient sanitary organization, but I have always been extremely skeptical about these claims. In regard to this particular comparison I have paid some attention in years past to the details of sanitary administration in Chicago and in Boston. There is no need here to say anything about the sanitary administration of Boston. We know that it stands foremost in this country. From what I have seen of the work done in Chicago it did not seem to me that it was equal to that done in Boston, and it has been surprising that men could be found to claim that the low crude death rate in Chicago was due to the sanitary activity of the municipal government of that

city. I am very glad indeed to have had it demonstrated here today that the death rate in Chicago is due to causes which are entirely beyond human control.

Mr. ALEXANDER WILSON. I don't profess to know anything about vital statistics, but I happened to have lived in Chicago for a couple of years and to have had some experience with the Boards of Health of both cities. I think all that Dr. Chapin has said is perfectly true, and I want to express my appreciation to Dr. Davis for explaining the reason of it all. It was a surprise to me to find the death rate in Chicago so low, and to find conditions as bad as they were there, with as little attempt as had evidently been made in the past to correct these conditions. A more efficient health commissioner is in charge now, and they are spending more money on their health department than before; but certainly things were in a pretty deplorable state until the present administration in Chicago. There is nothing in the health administration of that city that will account for the low death rate that the tables indicate. Their accuracy has been questioned, of course, but the local medical society a few years ago gave them a clean bill of health. They believe that their vital statistics are correct today.

CONDENSED MILK AND ITS VALUE FOR GENERAL USE AND FOR INFANT FEEDING.

By JAMES O. JORDAN and FRANK E. MOTT,
Bureau of Milk Inspection, Boston Board of Health.

The use of this type of milk has become so extensive as to warrant an investigation of the quality of some of the brands upon the market. The demand for condensed milk appears to be constantly increasing, and received a great impetus in 1907, when the price of whole milk was advanced throughout the city. This inquiry was commenced with a view of gaining an insight into the quality of some of these products, in order to determine whether or not their employment as substitutes for milk and cream is founded on economic principles, and also to ascertain if they are suitable for infant feeding. The claims made upon the labels of many of these specimens form an ample basis for study as to their value, when diluted with water according to directions, for subsequent use by both adults and the young. This research did not include all of the brands upon the market, but was confined to those which seemed to fairly represent the two types of condensed milk, namely, the sweetened and unsweetened varieties. The names of the brands examined, together with other information and the results of the analyses* are given in the following table:

*METHODS—The methods used in the chemical examination of the sweetened condensed milks were those given in the U. S. Dept. Agriculture, Bureau Chemistry Bulletin 107, pp. 122 and 123, except that in the determination of protein by the Gunning method the factor 6.38 was used instead of 6.25.

In the chemical examination of unsweetened evaporated milks, the following methods were used: Total solids, Bulletin 107, p. 123; Ash, Bulletin 107, p. 123; Milk Sugar, Optical Method; Proteids, by difference. Fat, a special modification of the Babcock Method, as follows:

Weigh 6.00 grams thoroughly mixed exaporated milk into a ten per cent Babcock Test Bottle. Add ten cubic centimeters of water, and mix thoroughly. Add 17.5 cubic centimeters sulphuric acid (s. g. 1.81) and, after mixing by rotation in the usual manner until all curd is apparently dissolved, place the bottle with contents in boiling water for twenty minutes. Finally, place test bottle with contents in centrifugal machine and finish as in regular Babcock Method.

TABLE A.

	I. Analyses of Condensed Milk.											II. Degree of Condensation, Calculations Based On.					III. Calculated Fat in Original Milk					
Brand	Price per Can, Cents	Wt. of Contents of Can, Gms.	Water	Total Solids	Cane Sugar	Milk Solids	Ash	Protein (Nx6.38)	Milk Sugar	Fat	Fat in 12.15 Milk Slds.	0.64% Ash	8.5% Solids Not Fat	8.9% Solids Not Fat	9.3% Solids Not Fat	Average	0.64% Ash	8.5% Solids Not Fat	8.9% Solids Not Fat	9.3% Solids Not Fat	Average	Ratio of Protein to Fat
Challenge.......	11	372	29.30	70.70	37.11	33.59	1.50	7.88	15.66	8.55	3.09	3.73	4.68	4.48	4.28	4.24	3.64	2.90	3.03	3.17	3 20	0.92
Green Mountain.	11	372	23.80	76.20	41.47	34.73	1.90	9.29	14.84	8.70	3.04	5.07	5.23	4.99	4.77	5.00	2.93	2.84	2.97	3.11	2.97	1.07
Summit.........	10	372	28.60	71.40	41.00	30.40	1.85	8.88	11.72	7.95	3.18	4.90	4.47	4.27	4.08	4.42	2.75	3.03	3.17	3.30	3.05	1.12
Cupid..........	10	337	24.10	75.90	45.32	30.58	1.54	8.55	14.04	6.45	2.56	4.40	5.19	4.96	4.75	4.82	2.69	2.27	2.38	2.48	2.45	1.32
Standard.......	11	403	25.80	74.20	41.63	32.57	1.75	8.37	13.60	8.85	3.30	4.69	4.78	4.57	4.37	4.60	3.23	3.17	3.32	3.47	3.30	0.95
Rose...........	12	410	27.65	72.35	38.76	33.59	1.58	7.83	15.18	9.00	3.27	4.04	4.73	4.52	4.32	4.40	3.64	3.11	3.26	3.41	3.34	0.87
Tip Top........	12	412	27.20	72.80	38.78	34.02	1.40	8.18	15.44	9.00	3.22	3.58	4.81	4.59	4.39	4.34	4.11	3.06	3.20	3.35	3.39	0.91
Defiance........	10	372	23.40	76.60	45.87	30.73	1.50	7.90	13.38	7.95	3.15	4.34	4.94	4.73	4.52	4.63	3.38	2.97	3.11	3.26	3.17	0.99
Eclipse.........	12	424	24.90	75.10	44.01	31.09	1.51	8.24	13.54	7.80	3.05	4.22	4.89	4.68	4.48	4.57	3.31	2.85	2.97	3.11	3.05	1.06
Red Cross.......	11	410	24.25	75.75	43.01	32.74	1.51	8.73	14.10	8.40	3.12	4.15	5.02	4.79	4.58	4.63	3.55	2.94	3.08	3.22	3.18	1.04
St. Charles*.....	10	338	70.15	29.85	.....	29.85	1.40	By difference 8.80	10.95	8.70	3.55	2.19	2.49	2.37	2.27	2.33	3.97	3.49	3.67	3.83	3.74	1.01
Van Camp*.....	10	447	73.05	26.95	.....	26.95	1.50	8.30	9.80	7.35	3.32	2.34	2.31	2.21	2.11	2.25	3.14	3.18	3.33	3.48	3.27	1.13
Carnation*......	5	180	75.60	24.40	.....	24.40	1.15	7.95	8.10	7.20	3.58	1.80	2.02	1.93	1.85	1.90	4.00	3.56	3.73	3.89	3.79	1.10
Carnation*......	10	450	73.65	26.35	.....	26.35	1.25	7.90	9.10	8.10	3.75	1.96	2.15	2.05	1.96	2.03	4.13	3.77	3.95	4.13	3.99	0.98
Highland*......	10	333	71.10	28.90	.....	28.90	1.30	9.00	9.60	9.00	3.79	2.03	2.34	2.24	2.14	2.19	4.43	3.85	4.02	4.21	4.11	1.00

* Unsweetened condensed milk.

While these findings may be considered from various points of view, the fat content of condensed milk is of chief importance from the manufacturer's standpoint, for the reason that the commercial value of milk is calculated on a fat basis. Under these circumstances the use of low grade milk, i. e., containing a small amount of fat, or a milk from which a portion of the fat has been removed (for cream or butter), will yield the manufacturer a higher profit than though a normal milk was employed. Thus the quality of milk used in these products is of interest to the consumer, and likely to be of financial advantage to the manufacturer. Unfortunately there is no method by which the exact amount of fat in the original milk may be determined. It is true, however, that calculations may be and are often employed to establish the quantity of fat in the milk before condensation, but at the best the results so obtained are only approximate. They are largely based upon the assumption that arbitrary factors, (as those for milk solids, solids not fat, or ash), selected for calculation purposes, represent the original milk. By employing for such data, however, average factors, close resemblance to the fat content may be attained. The calculations in the above table were to ascertain the degree of concentration and amount of fat in the milk used by the manufacturer. While the results obtained by use of the various factors are of interest, the averages are of chief importance, particularly in the closeness with which the average percentage of calculated fat agrees with the result obtained when 12.15 (the legal percentage of milk solids in Massachusetts) is used in determining this fat value. It is believed that the figures from this latter method, and the averages above mentioned, represent nearly the quality of milk which entered into these products.

It will be observed that there is considerable variation in the percentage of fat in the condensed milk, as shown in Table A. In the sweetened samples the minimum amount is 6.45 per cent, and the maximum 9.00 per cent, a difference of 2.55 per cent. In the unsweetened the difference is less, being 1.80 per cent, the minimum quantity being 7.20 per cent. and the maximum 9.00 per cent. Thus this product is extremely variable as to composition, not only as between different brands, but specimens of the same brand are not constant as to fat content; a difference of 0.9

per cent of fat having been found in two samples of one make. These differences are further emphasized by the work of other investigators.

While it is not possible, as previously indicated, to determine the exact amount of fat in the original milk from which condensed milk is prepared, approximations show that in the preparation of some of the above specimens, either milk of abnormally low grade was used, or milk was employed from which a portion of the cream had first been removed. In any event it is significant that very few of the samples shown in the above table indicate that milk of high grade was employed in their manufacture.

Despite the fact that the exact composition of the milk prior to condensation cannot be ascertained, it is feasible to estimate the value of condensed milk when diluted with water for use by the consumer. This has been accomplished by determining the cost of a quart of standard milk (Massachusetts law) containing 3.35 per cent* of fat, when made from these products by means of the addition of water. The weight, fat content and price of each brand was the data upon which these calculations were based.

The results appear in Table B.

TABLE B.

Showing the Cost of a Quart of Standard Milk Containing 3.35 Per Cent of Fat, When Made From Condensed Milk.

Brand	Cost Per Quart	Brand	Cost Per Quart
Green Mountain.....	11.1 cents	Van Camp.........	10 cents
Standard...........	10.1 "	Summit...........	11.1 "
Eclipse.............	11.9 "	Tiptop............	10.6 "
Red Cross..........	10.4 "	Rose..............	10.6 "
Highland...........	10.9 "	Challenge..........	11.4 "
Carnation(5 cent can)	12.6 "	Defiance...........	11.1 "
" (10 cent can)	9. "	St. Charles.........	11.2 "
Cupid..............	15.1 "		

* Much of the commercial milk has a fat content in excess of this amount.

It is plainly apparent from these figures that the use of condensed milk is unwarranted, if motives of economy are to be considered. The cheapest milk when so prepared, namely, that made from the Carnation brand, exceeds the price at which the householder usually purchases milk, nearly equals that of inspected milk, and, the cost in all other instances exceeds the price of inspected milk, and with two brands the expense would be above that of certified milk. It follows then in practically every instance that the product made by diluting condensed milk is the most expensive which the consumer can purchase; furthermore, from another point of view, comparison with inspected and certified milk is still less favorable to diluted condensed milk, for the production of milk for condensing purposes is never attended with the precautions for care and cleanliness which characterizes inspected and certified milk dairies. Inspected and certified milk is also procured from tuberculin tested cows, which cannot be claimed for that used in condensaries.

Condensed milk has a limited legitimate field, for which it was originally intended; namely, that of supplying a product where fresh milk is not available. Other than this its use is attended with unnecessary and unwarranted expense to the purchaser. The energy involved in the preparation of condensed milk, the tin cans used for containers, the marketing and advertising are factors tending to make the diluted milk expensive, and for all of these items the consumer pays. Small wonder that the cost of a quart of such milk is large. Where fresh milk can be obtained, the employment of condensed milk as a substitute is a luxury.

All of the samples examined bore labels upon which appeared directions for diluting the contents. It was deemed of interest to ascertain the character of the product which resulted when these directions were followed. This data was calculated from the original analyses. For comparative purposes it should be borne in mind that the standard for milk in this state is not less than 12.15 per cent of milk solids and not less than 3.35 per cent of fat. The results follow:

TABLE C.—COMPOSITION OF MIXTURES OF CONDENSED MILK AND WATER PREPARED AS DIRECTED FOR ORDINARY USE

Brand	Proportion of Milk to Water	Water %	Milk Solids %	Fat %	Milk Sugar %	Cane Sugar %	Pro-teids %	Ash %
SWEETENED								
Summit	1 to 4	85.72	6.09	1.59	2.35	8.19	1.78	0.37
"	1 to 3	82.14	7.61	1.99	2.93	10.25	2.22	0.47
Tip Top	1 to 4	85.43	6.81	1.80	3.09	7.76	1.64	0.28
"	1 to 3	81.79	8.51	2.25	3.86	9.70	2.05	0.35
Rose	1 to 4	85.51	6.73	1.80	3.04	7.76	1.57	0.32
"	1 to 3	81.90	8.40	2.25	3.80	9.70	1.96	0.39
Challenge	1 to 4	85.85	6.72	1.71	3.13	7.43	1.58	0.30
"	1 to 3	82.30	8.41	2.14	3.92	9.29	1.97	0.38
Defiance	1 to 4	84.66	6.15	1.59	2.68	9.19	1.58	0.30
"	1 to 3	80.81	7.70	1.99	3.35	11.49	1.98	0.38
Green Mountain	1 to 4	84.76	6.95	1.74	2.97	8.29	1.86	0.38
" "	1 to 3	80.96	8.68	2.17	3.71	10.36	2.32	0.48
Standard	1 to 3	81.48	8.14	2.21	3.40	10.38	2.09	0.44
Eclipse	1 to 4	84.96	6.22	1.56	2.71	8.82	1.65	0.30
"	1 to 3	81.22	7.78	1.95	3.39	11.00	2.06	0.38
Red Cross (a)	1 to 1 *	62.13	16.37	4.20	7.05	21.50	4.37	0.75
"	1 to 4	84.83	6.55	1.68	2.82	8.62	1.75	0.30
Cupid	1 to 4	84.80	6.12	1.29	2.81	9.08	1.71	0.31
"	1 to 3	81.01	7.65	1.61	3.51	11.34	2.14	0.39
UNSWEETENED								
Carnation (5 cent can)	1 to 2	91.87	8.13	2.40	2.70	None	2.65	0.38
" (10 cent can)	1 to 2	91.21	8.79	2.70	3.03	"	2.64	0.42
St. Charles (b)	1 to 1 †	85.06	14.94	4.36	5.48	"	4.40	0.70
" "	1 to 2 †	90.05	9.95	2.90	3.65	"	2.93	0.47
" "	1 to 3 ‡	92.53	7.47	2.18	2.74	"	2.20	0.35
Van Camp (c)	1 to 1	86.53	13.47	3.67	4.90	"	4.15	0.75
" "	1 to 2	91.03	8.97	2.45	3.26	"	2.76	0.50

* "Cream." † "Rich milk." ‡ "Economical milk."

(a) 20.6 fluid ounces of this mixture would cost 11 cents.

(b) 22.4 " " " " " 10 cents.

(c) 29.6 " " " " " 10 cents.

It will be observed from the above figures that the product of these dilutions in all but three instances is of extremely poor quality, and not suitable to be characterized or used as milk. Those who prepare milk on the above basis are practising self-deception. Each consumer who follows these labelled directions thus becomes a milk adulterator, and is using water with a degree of liberality which would astonish the most brazen of former old-time milk manipulators. With three exceptions, the value of these diluted products depends principally upon bulk; quality is a minor consideration. They are mostly rich in water, but in little of other milk constituents. More economy would follow and there would be no sacrifice of quality (eliminating the above exceptions), if to a quart of fresh milk one-third to more than one quart of water was added. Products would result in nearly every instance which would equal the extremes of those which appear in the above table. In the case of the three exceptions previously mentioned, where the products are diluted with an equal part of water, mixtures result containing more than the legal amount of fat but their cost, considering the resulting volumes, would by comparison with the price of an equal bulk of milk be prohibitive. Sweetened condensed milk may be diluted to a greater extent than the unsweetened, without the difference in thinness becoming manifest, by reason of the "body" given the sweetened product by the added sugar.

It is largely upon the fraud basis, namely, the supposition that condensed milk could be diluted freely with water, and that the resulting mixtures possessed the approximate qualities of normal milk, that manufacturers of condensed milk have secured the present enormous and profitable business. The public has been deceived, and for this the manufacturers are responsible. The directions on the labels of some of these brands are general, while with others they are specific. One, the "Peerless,"* directs dilution with water to the required consistency for "purposes where ordinary milk or cream would be used." The sample of the condensed product examined contained only 8.00 per cent of fat, while the legal fat standard of cream in Massachusetts is 15 per cent. Even without dilution the Peerless

* The analysis of this brand does not appear in Table A.

brand would not be legal cream in this state. The label on the St. Charles brand states that the product has been "reduced to the consistency of cream." It contained only 8.70 per cent of fat, and the "rich milk" made by diluting this product according to directions would have contained fat as follows:

(1 of milk to 1 of water) = 3.98 per cent of fat; (1 of milk to 2 of water) = 2.65 per cent of fat, while the "economical milk" (1 of milk to 3 of water) = 1.99 per cent of fat.

The label of the Highland brand states that for certain uses "it may be slightly diluted with water, and for other purposes it may be further diluted to any desired consistence." The original contained 9.00 per cent of fat.

The label on the Red Cross brand states that "mixed with an equal quantity of water, an excellent quality of cream is produced." A mixture so made would contain only 4.50 per cent of fat. The "rich milk" of this brand, prepared according to directions, would contain only 2.59 per cent of fat. Dilute "according to personal taste" with "one or two parts of water" is the recommendation on the label of the Van Camp brand. These mixtures would have contained fat respectively as follows:

(1 of milk and 1 of water) = 3.67 per cent of fat. (1 of milk and 2 of water) = 2.45 per cent of fat.

Thus statements not always characterized by truth find a conspicuous place upon the labels of many brands of condensed milk, and these claims are apparently valuable assets to the condensed milk business.

The most important feature of these preparations in their bearing upon the human economy is that of their employment for infant feeding. Directions for making dilutions for this purpose appear upon the labels of many brands. The fallacy of their use as nourishment for infants is shown in the following table, which indicates the proportion of the constituents of the different mixtures, when made according to the printed formulae. These percentages are calculated from the analyses of the undiluted milk, like those in the preceding table.

TABLE D.—COMPOSITION OF INFANT FOODS WHEN PREPARED AS DIRECTED.

Brand	Age of Infant	Proportion of Milk to Water	Water %	Milk Solids %	Fat %	Milk Sugar %	Cane Sugar %	Pro-teids %	Ash %
Highland*.	1 week.	1 to 16†	98.29	1.71	0.53	0.57	None	0.53	0.077
" *.	10–12 months. . .	10 to 36†	93.76	6.24	1.96	2.07	"	1.93	0.28
St. Charles*.	1 month.	1 to 7	96.26	3.74	1.09	1.37	"	1.10	0.18
" " *.	2 months.	1 to 6	95.74	4.26	1.24	1.56	"	1.26	0.20
" " *.	1 year.	1 to 3	92.54	7.46	2.17	2.74	"	2.20	0.35
Red Cross.	1 month.	1 to 13	94.60	2.33	0.60	1.01	3.07	0.62	0.10
" "	2 months.	1 to 11	93.69	2.73	0.70	1.18	3.58	0.73	0.12
" "	3 months.	1 to 10	93.12	2.97	0.76	1.28	3.91	0.79	0.14
" "	6 months.	1 to 9	92.43	3.27	0.84	1.41	4.30	0.87	0.15
" "	1 year.	1 to 6	89.17	4.68	1.20	2.02	6.15	1.25	0.21
Green Mountain.	Use according to	1 to 14	94.91	2.32	0.58	0.99	2.77	0.62	0.13
" "	age andstrength of child	1 to 8	91.53	3.86	0.97	1.65	4.61	1.03	0.21
Summit.	" "	1 to 14	95.24	2.02	0.53	0.78	2.74	0.59	0.12
"	" "	1 to 8	92.06	3.38	0.88	1.30	4.56	0.99	0.21
Standard.	New-born.	1 to 16	95.64	1.91	0.52	0.80	2.45	0.49	0.10
"	"	1 to 14	95.05	2.18	0.59	0.91	2.77	0.56	0.12
Carnation (5 cent can)*	Reduce according to age	1 to 6	96.51	3.49	1.03	1.16	None	1.14	0.16
" " " *	" "	1 to 4	95.12	4.88	1.44	1.62	"	1.59	0.23
" (10 cent can)*	" "	1 to 6	96.23	3.77	1.16	1.30	"	1.13	0.18
" " " *	" "	1 to 4	94.73	5.27	1.62	1.82	"	1.58	0.25
Cupid.	Use according to	1 to 14	94.94	2.04	0.43	0.94	3.02	0.57	0.10
"	age and strength of child.	1 to 8	91.57	3.40	0.72	1.56	5.03	0.95	0.17

* Unsweetened. † The addition of cane sugar is suggested by the printed directions.

Some of the brands make no claim of adaptability for infant feeding and are omitted from this classification, while others seek to foster the use of this substance. One, the Red Cross, under the caption "Important to Mothers" asserts that "Red Cross is prepared especially for Infants. The most perfect substitute for mother's milk. Feed it to your babies and you will use no other. It possesses special nutritive qualities as a food for children." The composition of these mixtures, as shown in the above table, presents a condition both condemnable and criminal. The manufacturers of condensed milk could not have advocated, even though it be by implication, their employment so diluted, without being aware of the small amount of food value which they represented. Such a degree of culpability warrants the severest censure. The profit resulting from the sale of condensed milk for infant feeding, on the basis of these labelled directions, is iniquitous. Not one of these mixtures, even the most concentrated, represents the composition of normal milk during any period following child birth. They rather imitate starvation diet. The employment of milk for an infant not a week old, containing 0.53 per cent of fat, 0.57 per cent of milk sugar, 0.53 per cent of proteids and 0.077 per cent of ash, when human milk four to six days after child birth* contains 2.97 per cent of fat, 6.47 per cent of milk sugar, 2.25 per cent of proteids, and 0.30 per cent of ash, is likely to be attended with disastrous results. This single example is sufficient to show the fallacy of these printed statements. There is the further disadvantage of the presence of cane sugar in these sweetened condensed milks, and in the formulae of some of the unsweetened products the addition of cane sugar is recommended. This is important, in view of the fact that many physicians are of the opinion that this substance is to be avoided in infant feeding. Assuredly its employment should not be suggested by a manufacturer, even though it is essential to the financial success of his product.

There is another aspect of this condensed milk question not lacking in interest, namely, that of bacterial content. Undoubtedly this substance is supposed by laymen to be free from bacteria, and the printed matter upon some of the packages is not

*Carter & Richmond. Dairy Chemistry, by Henry Droop Richmond, p. 324.

such as to disabuse the minds of consumers upon this point. The fact is that while a few of the brands were found to be sterile, with the majority there is no uniformity respecting bacterial content, and while one or more samples of a brand may be sterile, other packages of the same brand may contain large numbers of organisms. This condition was demonstrated by the examinations which were made. The brands found to contain bacteria appear in Table E together with the maximum counts obtained.

TABLE E.

*Bacteriologic Examination of Condensed Milk.

Brand	Bacteria Per Cubic Centimeter	Brand	Bacteria Per Cubic Centimeter
Tip Top	200,000	Green Mountain	570,000
Defiance	520,000	Red Cross	560,000
Cupid	2,000	Challenge	10,000,000
Standard	900	Eclipse	280,000
Summit	17,500	Rose	850,000

* These examinations were made in the Bacteriological Laboratory of the Boston Board of Health through the courtesy of the Director, Dr. Francis H. Slack.

SUMMARY.

First. Condensed milk is seldom prepared from milk rich in fat. Analyses of several of the samples indicate that in a majority of the brands the original milk used was either of low grade in respect to percentage of fat, or that the milk had been skimmed.

Second. The present extensive employment of condensed milk is mainly due to the fact that consumers believe these products can be largely diluted with water, and yield a mixture which closely approximates the composition of milk. This opinion is fostered by the printed matter which appears upon the labels of the different brands. By following the definite and indefinite directions for water dilutions, mixtures impoverished in all milk constituents other than water are obtained, and the

latter is present in excessive amounts, with the exception of the three brands before mentioned, and then only when dilution is with an equal bulk of water.

Third. If condensed milk is diluted with only enough water to make a quart of Massachusetts standard milk, i. e., containing 3.35 per cent of fat, the cost of the latter exceeds the price of ordinary milk, and in some instances equals the price of inspected milk, and in others is more than that of some brands of certified milk. It follows that condensed milk cannot be employed economically where whole milk is procurable.

Fourth. Condensed milk is recommended by implication as a food for infants by those who manufacture it, and directions for dilution for this purpose appear upon the labels of most brands. Mixtures made according to the formulae suggested would be deficient in practically every instance in percentage of milk constituents, as compared with human milk. Furthermore, they either contain or the printed directions suggest the addition of cane sugar, which substance is deemed an objectionable ingredient of infant foods by many physicians. The employment of condensed milk for this purpose is no doubt often at the expense of infant life, and is to be vigorously condemned. The labels on these packages should bear a warning against the use of the contents as food for babies.

Fifth. The impression that most condensed milk is free from bacteria is not founded on fact.

Sixth. There is no justification in the use of misleading statements by the manufacturers of these substances. This should be prohibited by law.

Seventh. Packages of condensed milk should bear a formula for diluting with water, so that the resulting product shall not be below the standard for milk solids and fat of any state in which the original product may be sold. Legislation to this end should be sought in every State in the Union.

DISCUSSION.

Dr. FRANCIS H. SLACK. Professor Jordan's paper has thrown a flood of light on this subject, and such information should be widespread, in order that people may not be deceived by the labels that go out upon this kind of milk. We have long been finding fault with impure milk and condemning it because of its share in producing high infant mortality and morbidity. If we can condemn our market milk for that I think we can more justly condemn condensed milk, which not only may be high in bacterial content, but, as has been shown here, is often very low in nutritive values. It would be very interesting to know the dairy conditions where such milk is produced. Here in Boston we examine milk continually, making bacteriological and chemical examinations, in order to keep it up to the standard. Our contractors are using every effort to keep the dairies in sanitary condition as a result of these examinations, and still with all that is going on it is with the utmost difficulty that we are able to keep some of these dairies even in a passable condition. What must be the condition of dairies where the only examination that is required is one for a percentage of fat when the milk is delivered at the creamery? I suppose that some of these people do try to produce clean milk, but I think we might fairly take as a sample the case of the Borden Condensed Milk Co., who, as it seems to me, have earned the condemnation of all right thinking people by the stand they have taken against pure milk in the fight they are waging against the Montclair, N. J., Board of Health. I have recently heard of an inspection that was made of the dairies of one other firm who make condensed milk. It was said that the dairies were in a most unsanitary condition, and it is legitimate to suppose that such dairies would be in fairly unsanitary condition where no inspection is required. Even if the milk is sterilized in the process of evaporation it would seem that with such dairy conditions as prevail it would be absolutely unfit for infant food, on account of its filthy condition before the process of evaporation.

There is one more point I thought of bringing out here, and that is the uncertainty as to the age of this milk as we buy it in the stores. There is nothing on the label to indicate when

the milk was produced. We buy a can of this milk in the store; it may be one year old or ten years old. If such milk is to be put on the markets there certainly should be some legal restriction. It should be required that it be dated, and after a certain time limit it should be destroyed. Such food must deteriorate in tin cans as much, it seems to me, as other foods we have heard so much about lately, deteriorate in cold storage. I have brought with me here one of the labels which reads:

"Prepared especially for infants. The most perfect substitute for mother's milk. Feed it to your babies and you will use no other." That last sentence, "Feed it to your babies and you will use no other," seems almost like a bit of prophecy. It reminds me of a sign I saw once in a restaurant window which read: "Eat here once, and you will never eat anywhere else."

Mrs. RICHARDS. I have been wondering where the Pure Food Law was that allowed these labels to continue. This case of dilution with 16 parts of water reminds me very much of the label on the old time package of Grape Nuts, which said: "This package contains as much nutriment as ten pounds of beef." I made a remark before a woman's club about that at one time, and immediately heard from the Grape Nuts people. I asked their representative to define what he meant by "nutriment"—if they meant to say that this little package of Grape Nuts had as much fat in it, or if it had as much proteid, or what it was that he called "nutriment." The only thing you could imagine would be that it contained more starch than ten pounds of beef. It does seem to me as though any label like that in regard to diluting condensed milk with water should be capable of criminal prosecution, because it is causing starvation.

As many of you know, we began our study for the children of Boston with the Orange County "evaporated" milk in 1890, because then the milk problem was in bad shape. We could get this milk then which we could sell to the poor mothers at six cents a quart, of as good value as we could get in the stores for that price and much cleaner and safer. We analyzed it, and kept track of it. It came from a carefully inspected establishment. It was evaporated at reduced pressure at 130° F. but not put up in cans. We used that for eight or ten years, and

we saved every baby we put on it. We had in ten years about 100 cases of children that had practically been given up. We had one very interesting case from a physician who sent word to us at the New England Kitchen that he wanted to try this milk on an out of town case. Some was sent, and I discovered later they had not sent any directions for diluting it. That milk was condensed four and a half to one and used undiluted. I expected the baby would die. On the contrary, we found that the baby had thrived from the first teaspoonful and would not take it diluted afterwards.

Dr. N. C. DAVIS. I would like to ask Professor Jordan in this connection a question which with these figures here it might be interesting to have answered. He has calculated in his first chart what the cost of this milk would be as compared with Massachusetts standard milk, 3.35 per cent. fat. It might be interesting to find out whether the cost would be increased over these figures on average Boston milk. That is, is the average standard of milk in the city of Boston above 3.35? If it is, wouldn't that make those figures still higher?

Professor JORDAN. Most certainly it would; but I have taken our standard as a basis for the calculation.

Dr. N. C. DAVIS. About how much higher would that make these figures using the fat content of average Boston milk as a basis for the calculation.

Professor JORDAN. I have no calculations to determine that, but the difference could readily be ascertained.

Mr. HARWOOD. (Barre). I consider this question one of the most important that has been brought before the public for a long time. I, myself, am interested in two phases of this question. One is public health, and the other is the welfare of our dairy interests. As a matter of fact, last year there were something like 6,000,000 less quarts of milk shipped into Boston than was the case in 1906. I have recently had occasion to do a little figuring on this subject. In 1906, in round numbers, there were 114,000,000 quarts of milk shipped into Boston by rail; last year there were 108,000,000. On the basis of the

increase of population—I took as the basis the increase from 1900 to 1905—if that same ratio had continued and the per capita consumption of milk had remained the same as estimated by the Department of Agriculture at Washington, there should have been 10,000,000 more quarts shipped into Boston last year than were shipped in here last year, or 4,000,000 more than were shipped here in 1906. What has taken the place of those 10,000,000 quarts of fluid milk which might have been shipped in here? It is reduced milk in some form or other, either condensed, or evaporated, or concentrated, or powdered milk, or all these together. It is not to be supposed that people have given up the use of milk. The use of this reduced milk has come to amount to something of no mean proportions; but the ignorance on the part of the people which up to now has existed in regard to the quality of condensed milk, it seems to me, is about to be dispelled when we get such a paper as we have heard today from Professor Jordan.

Covering this matter I drew a bill, after consultation with Professor Jordan and some others, and presented that bill to the Legislature, and what was the result? These great manufacturing concerns, one of which I understand is capitalized at $35,000,000, and has, if I remember rightly, 65 different condensories scattered throughout this country from New York to California, together with some other large concerns, came down here to the Legislature, certain activities were started and this bill was simply snowed under. Some of the newspapers came out in the city of Boston and ridiculed the idea of such a bill. Before another year elapses I predict they will have a different view of this matter.

I hope that other organizations will take up this subject and that Professor Jordan and others who are competent to give proper information will be called upon to do so, in order that the public may become awakened and through them the legislators on Beacon Hill. That is the only way we can counteract the influence of great corporations. When the people become educated, then the consumers in this state will be protected, as they should be, by having proper labels upon containers of these reduced milks.

Someone has asked, "Where is the pure food law?" That pure food law, the United States government law which is popularly supposed to protect the people, is used to deceive, in a way, by these very manufacturers, because there is placed nothing further upon the package than that it contains pure milk, and says it is "guaranteed under the pure food and drugs act."

The number of cows in Massachusetts is 32,000 less than it was in 1890, and it has been growing less during the last three years at the rate of 4,500 a year. I contend that it is for the interest of every consumer in this Commonwealth that Massachusetts milk be produced for Massachusetts people and be produced so clean and in such good condition that it will have a name and a reputation for itself. Confidence between the consumer and the producer is the most important thing at this time, outside of this unfair competition. The welfare of the dairymen of this Commonwealth is more important than seems at first thought. Raising the price of fluid milk one cent a quart usually creates a great hue and cry, with the papers at least, and among many consumers, but what does it mean? Take milk at nine cents. People instead of paying that price run over to the grocery store and buy some of this reduced milk which you have heard discussed here today and pay a greater price for it. That, I contend, is foolish for the consumer and unfair to the producer.

We are entering an era of intensive agriculture. The consumers are complaining about high prices. These prices could be lowered if the production of food products was increased. How are we going to increase the fertility of our soil? Fires and improper cropping have removed the humus. You can buy commercial fertilizers and return elements of fertility to the soil, but the humus so necessary in the conservation of moisture and as essential as anything else to the rejuvenation of this soil cannot be put back except as it can be done economically. Green crops, as a rule, cost too much to plow in, and barn-yard manure remains the only profitable means of supplying that humus, in connection, of course, with the fertilizing elements which it contains. Destroy the animal husbandry of this state,

as is being done at the present time through low prices and unfair competition, and you still further destroy the producing power of the soil.

What does this raise of a cent on a quart of milk amount to? It amounts to comparatively nothing in the end, not more than about $1.20 a year per person. That does not seem much, while if measures are taken to build up the animal industry in this state, improve the fertility of the soil, increase the crops and secure a better milk product, the consumer would be one of those most benefited. I contend therefore, that it is in the interest of everybody in this Commonwealth to join with the agricultural interests and by improving the dairy industry bring back the fertility of the soil, and I consider this discussion here today one good move in that direction.

Dr. CHAPIN (Providence). There is one point that has not been emphasized, or at least not very strongly, namely, the danger from condensed milk due to keeping the can open in the house. That subject has been investigated quite a little in England. Sandilands, in London, studying the incidence of summer diarrhoea, found, as others have, that it falls with exceptional severity upon children fed on condensed milk. In that section of London where he worked, the milk that was used was chiefly Nestle's. He investigated the conditions under which it was put up in Switzerland and found that they were almost ideal, that the dairies were in fine condition and the chance of infection of the milk was very small. But when the cans are opened and kept open in the house they can be seen black with flies; they remain that way for two or three days to a week. He believes, as do very many of the leading English health officials, that the chief cause of infantile diarrhoea is infection in the house, and they believe that there is no easier way to get that infection into the child than by the use of condensed milk.

To Professor Jordan we owe a debt of gratitude for this paper. He has worked hard to get the facts, and has presented the facts in a clear manner, and they are facts that everyone of us wants to use every day in our fight against these evil influences. I would like to ask Professor Jordan if he knows anything about

the dried milk which they are using a good deal in England. Some of the health officials there speak very highly of it, and at the municipal milk depot in Sheffield they have been using it in place of the clean milk or the sterilized milk such as we use here. There are also favorable references to it in other English health reports.

Professor JORDAN. In answer to Dr. Chapin, I wish to say that some time ago I investigated a powder made from skimmed milk, which was recommended for bakers use because of its low cost. I found that when used according to directions, a very low grade of skimmed milk resulted, but that if enough of the powder was employed to make a skimmed milk which agreed with the Massachusetts standard, the cost more than equaled that of skimmed milk. Last summer we had occasion to examine one of the powdered milks sold in cans, and I made no calculations as to the cost of the fluid product. A solution could be made from it which approximated the composition of the standard milk of this State; the powder, however, was not free from bacteria.

Prof. M. J. ROSENAU. I am very much surprised to hear that some of these canned milks have such a low nutritive value, and are sold at such a comparatively high price. It was further a matter of surprise to me that sweetened condensed milk is far from being sterile, but contains a large number of bacteria, in certain cases as high as 10,000,000 per cubic centimeter. Such a milk would not be allowed to be sold in accordance with the city regulations were it sold just as milk.

It seemed to me that Professor Jordan in his conclusions has been quite conservative. He might have gone a good deal further, because all of those who have dealings with the children's diseases know that the larger per cent. of rickets and scurvy occur among those babies who have used this class of milk as the chief article of food. There is something about it which predisposes particularly to the nutritional diseases of this class.

The key-note of the whole matter is not a desire to abolish the use or sale of this particular class of milk, for it has a certain place in our dietary, and in our condensed civilization it has

certain uses on account of its keeping qualities; but the whole point is that it should be labeled honestly and sold for just what it is. The statements on the labels, as pointed out in Professor Jordan's paper, at times are so at variance with the facts as to the contents of the cans that these particular brands should come under the purview of the pure food and drug law, since they involve just as much fraud as selling other things mislabeled in many other ways.

These are the chief facts that occur to me, and I thank you very much, Mr. Chairman, for this opportunity to commend and endorse this able and timely paper.

PERSONAL HYGIENE.

By PERCY G. STILES, Ph. D.,
Assistant Professor of Physiology in Simmons College.

WATER DRINKING. This is a subject about which much is written from theoretical standpoints. The familiar teaching has been to the effect that water drinking is to be encouraged and that there is rarely any reason for its restriction unless it be at meal times. The chief services of water in the human system are connected with the carriage of waste products and the promotion of heat discharge through evaporation from the skin and respiratory passages. The requirement of water for urinary secretion is dependent upon the amount of protein and salts in the diet. The requirement for evaporation is conditioned by external temperature and the degree of muscular activity. Thirst can be relied on to prompt one to take sufficient water to meet the latter need. Whether the instinctive practice is the best possible for the kidneys is far more questionable.

It was long ago pointed out by Dreser, a German pharmacologist, that the urine is usually much more concentrated than the blood from which it is derived. The depression of the freezing-point, which is a convenient measure of concentration, is nearly a constant for blood (0.56° C.) while the value for urine is generally twice as great. It may be still more considerable, reaching 4° C. under conditions which force the kidneys to eliminate a maximum of dissolved substances in a minimum volume. To separate from a solution of a lower concentration one which has two or three times as great an osmotic pressure is a task which cannot be accomplished without the expenditure of energy in large and perfectly definite amounts. Dreser calculated that the kidney epithelium may exert a force far in excess of that developed by contracting muscle. If this is the case it is plain that the daily nitrogenous and saline waste must be more easily discharged by the kidneys when enough water is provided to make the urine approximate to the concentration of the blood. A urine less concentrated than the blood is a possibility but one

which is rarely realized. It has been demonstrated after free consumption of beer. The foregoing considerations seem to justify the teaching that most people need to cultivate the habit of water-drinking. Apart from the saving of the kidney epithelium a voluminous urine tends to insure the successful removal of the less soluble constituents such as uric acid. The layman may easily suppose that the work of the kidneys depends upon the amount of water passing through them. As a matter of fact it is apt to be greatest when the volume is least.

The advisability of drinking water without stint at meal times is a special question which must be treated apart from the general one. Several points may be made against it. Marked cooling of the stomach contents must somewhat delay digestion. This cannot be considered a serious matter since harmful fermentation will be postponed in about the same measure as the normal process. The chilling of the stomach walls with consequent retardation of gastric secretion is probably of greater moment. A still more important objection is the temptation to neglect mastication and to substitute swallows of cold water for the saliva which would better be used to soften and wash down the food. The claim that water dilutes the digestive juices so as to lessen their effect is probably groundless. A given quantity of enzyme will act at a nearly constant rate in widely varied volumes of water.

A test of the influence of water with meals upon nutrition has now been made by Dr. P. B. Hawk, of the University of Illinois, and he has presented his results to the American Physiological Society. His subjects were healthy young men. Upon certain days each took but 900 grams of water. Upon other days with about the same solid food they took 3900 grams per man, most of it at meal times. Determinations of the urinary nitrogen showed a slight increase in the output on the days of free water-drinking. This result had been obtained by other observers and had been attributed to a slight increase of protein metabolism or to a more complete elimination of waste. Dr. Hawk took a step beyond his predecessors by determining the fæcal as well as the urinary nitrogen. From his figures it appears that the increase of urinary nitrogen just noted corresponded closely with a reduction of the fæcal nitrogen on the "water days." In other

words, the increased consumption of water led directly to a more nearly perfect absorption of protein. It is true that the fæcal nitrogen on the days of restriction was singularly large (over two grams). It may therefore be claimed that the demonstration is of the bad effects of minimal drinking rather than of the benefits of the freest use of water at meals. This is recognized by Dr. Hawk who promises further experiments with less extreme conditions.

The results already at hand are suggestive. If one avoids the chilling effect of a great deal of cold water and takes pains not to slight mastication there seems to be no reason for denying one's self the water which is craved at the table. The water in tea, coffee, malt liquors, thin soups, and milk of course acts in the same way as water taken separately. Indeed, a factor contributing to the success of Fletcherism may be the extreme dilution of all food with the water of saliva. One of the striking results of this popular practice is the reduction of fæcal nitrogen to a low level and Dr. Hawk's observations suggest a partial parallel. Evidently one must make large allowances for the peculiar properties of different waters, some of which may prove to be constipating while others promote peristalsis. Free drinking of relaxing waters would almost certainly diminish the percentage of absorption.

VETERINARY HYGIENE.

By W. L. BEEBE, D. V. M.,
Bacteriologist for the Minnesota Live Stock Sanitary Board.

STATE AND MUNICIPAL MEAT INSPECTION. During the last few years the subject of state and municipal meat inspection has been much discussed. Few states have ventured to put a law on the statute books requiring inspection, as there are so many difficulties that would prevent an efficient anti-mortem and post mortem inspection in the rural districts, particularly in states that are sparsely settled. If such a law would be impractical there is no reason why one requiring cleanliness and sanitation around slaughter houses would not be feasible. Several states require creamery inspection and it is not an exaggeration to say that the sanitary conditions in slaughter houses where federal inspection does not exist is far worse than it is in creameries. If the people could see the building and surroundings where food producing animals are killed, they would probably rise up in a revolt. It is not likely they will do so until the matter is brought to their attention as Upton Sinclair did when he published "The Jungle."

If anti-mortem and post-mortem inspection is unpractical in the country it is not in cities. The main difficulty in the city seems to be that the slaughter houses are scattered and the proprietors prefer to kill at hours that would prevent one or two inspectors doing the work. Why not adopt the method of segregation of slaughter houses the same as is done in Europe where over 600 slaughter houses belonging to municipalities exist. If this method be adopted modern machinery would save for the butchers an amount which would to a large extent compensate them for the animals condemned. A. M. Farrington,* Assistant Chief of the Bureau of Animal Industry, estimated that during the year 1907, there were 4,972,052 head of cattle, 7,793,133 sheep and 10,316,300 hogs slaughtered in the United States by

* The need of state and municipal meat inspection to supplement Federal Inspection. Report of Bureau of Animal Industry, 1908, pp. 183–96.

butchers without government inspection, while there were 7,633,365 cattle, 10,252,076 sheep and 32,885,377 swine slaughtered under government inspection. Among some the conditions mentioned in his article that were found in and around the small slaughter houses are as follows: The slaughter houses are usually located on some back street or outside the corporation limits. Many times they are located on the banks of streams and the drainage is toward the water. Frequently the offal is thrown out to decay or be eaten by hogs and rats, or washed away by the water. Old dairy cows are frequently killed in these houses and from the prevalence of tuberculosis in these cows it follows that the disease will be transmitted to the swine that eat the offal. Hog cholera and certain parasitic diseases are frequently transmitted by this unsanitary method of disposing of offal. The Indiana State Board of Health recently made an investigation of conditions of slaughter houses in the state and out of 327 establishments inspected only 7% were found to fulfill the sanitary standard. Not infrequently in cities where municipal inspection exists the inspectors are laymen not familiar with the diseases of animals.

A very interesting feature of Dr. Farrington's article is the mention of the saving that would be made in the by-products if modern machinery was installed and modern methods adopted. He states that fat cattle dress 60% of the live weight, sheep 50%, and hogs 80%. A large portion of the remainder may be saved in a modern abattoir. Packing house statistics show that in the case of cattle the value of the hide and offal would probably increase the total percentages to 75%. In other words the 40% offal would be equivalent to about 15% of meat. From the facts it would seem as though sanitarians ought to try to have laws passed which would remedy these deplorable conditions.

THE TRANSMISSION OF AVIAN TUBERCULOSIS TO MAMMALS. In the last few years avian tuberculosis has been reported by Pernot in Oregon, Ward and Moore in California, Higgins in Canada, Burnett in New York, the Bureau of Animal Industry in Michigan, and the writer in Minnesota. In several localities the ravages of this disease makes it apparent that it will soon be a more serious menace to the chicken raising industry

than is commonly supposed. Many bacteriologists and scientists are prone to overlook the possibility of transmission of avian tuberculosis to mammals as scientific evidence shows that it is infrequent that such transmission takes place either experimentally or by natural means. It is, therefore, of much interest to report the results of an investigation where it was quite evident that avian tuberculosis was transmitted to swine under natural conditions.

Mohler and Washburn* recently reported such an outbreak which occurred in Oregon. Avian tuberculosis existed on a certain farm and later the pigs were found to be affected, when killed at an abattoir where government inspection is maintained. The history indicated that the tuberculosis in swine did not come from cattle. Several fowls that were tubercular were shipped to the Bureau of Animal Industry, Washington. Two tuberculin-tested pigs two and three months old were fed the tubercular viscera of these fowls. Examinations post-mortem after 104 days revealed lesions of tuberculosis in the submaxillary and mesenteric glands and liver in one pig, and in the submaxillary and mesenteric glands in the other. Cultures were found to conform to the morphological and biological characteristics of the avian tubercle bacillus. During the time these hens were kept at the laboratory two eggs were found in the cage. Guinea pigs were inoculated intra-abdominally from the yolks and whites. The guinea pigs which were inoculated from the white showed tuberculosis upon post mortem examination. From the results of these investigations it would seem that we are now justified in considering tubercular fowls and their eggs dangerous to mammals.

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*Report of Bureau of Animal Industry, 1908, pp. 165-176.

ERRATUM:—In February issue, page 197, under Veterinary Hygiene, thirteenth line from bottom, 3d word should read *not* in place of *now*.

SANITARY ENGINEERING NOTES.

By ROBERT SPURR WESTON,
Assoc. M. Am. Soc. C. E.,
Boston, Mass.

BRESLAU WATER CALAMITY. Lührig. Gedanken über die Sanierung des Breslauer Grundwassergewinnungsanlagen. Gesund. Ing. **31**, 629–37. Chem. Zentr., 1909, I, 321.

Oettinger, W. Die Ursachen des Einburchs von Eisen und Mangansalzen in das Breslauer Grundwasser, mit besonderer Berucksichtigung der Bodendurchlassigkeit in der Ohle-Oderniederung. Klin. Jahrbuch. **19**, 305–421. Chem. Zentr., 1909, I, 226.

Debusmann. Wasserkalamitöt in Breslau. Chem. Zentr. 1908, II, 7189.

Debusmann. Die Ursachen der Wasserkalamitöt in Breslau und die bisherigen Massnahmen zu ihrer Bereitigung. Jour. f. Gas. u. Wasser. **42**, 963, 990.

All of these articles have to do with the sudden outbreak of manganese in the Breslau water supply, the attempts to explain the reason for the outbreak, and the means for overcoming the difficulty. The contributory parts of the various contributions are admirably summarized in the last reference.

Previous to 1871 the water supply of Breslau was from surface wells. Between 1872 and 1879 an open sand filter was built and in 1891–2 a covered sand filter also having a capacity in 1893 of about 11,600,000 gallons daily. These filters took water from the Oder and their bacteriological efficiency was not always satisfactory. This was because of the rapid increase of population in the industrial cities above the city, increased water traffic on the river, and also to the low efficiency of the filters during periods of turbid water. Largely through the influence of Professor Flügge a preliminary study of the ground water supply was made, which resulted before the close of 1904 in a new ground water supply from the Oder valley above the city and the abandonment of the slow sand filters. This supply

which had a capacity of 16,000,000 gallons daily was derived from 313 6-inch wells driven to depths varying from 33 to 40 feet and placed 70 feet apart. The wells were arranged in three lines and part of them were overflowed at extreme high water. The soil of the Oder River water is made up of a layer of humus matter, silt, and clay, under which is a stratum of alluvial sand in various sized grains. Beneath the sand is diluvial clay 100 to 235 feet in thickness, the top of which is from 30 to 55 feet below the surface. The surface layer of loam, peat, and clay is from 7 to 10 feet thick. The ground water level before beginning the daily pumping was from 20 to 40 inches below the surface of the ground. Beginning with January, 1905, ground water exclusively was supplied to Breslau. Up to March 27, 1906, the ground water level had sunk to 25 feet below the surface during pumping. Previous to this date there had been little rain. There was a deferrization plant in connection with the system consisting of a coke aerator and gravel filter of the Piefke type. The aerator is 2 m., the filter 1 m., deep, and there is a small basin between the aerator and filter.

On March 28, 1906, the river rose and overflowed the third line of wells and also part of the second line. Soon the soil air got beneath the flood water and appeared in the wells, so much of it in fact that the air pump could hardly keep the suction main free. At the same time the amount of iron increased to 440 and the manganese to 220 parts per million. For a time the deferrization plant removed the iron successfully but the manganese passed on to the city and made the water useless for domestic purposes. The supply was abandoned, filtered Oder River water was again supplied to the city, and three open filters were built to tide over the emergency. Many explanations were at once offered but even today no one explanation is universally accepted. Some authorities said that the manganese came from below the water bearing strata, being forced upward by the pressure of artesian water through from 100 to 235 feet of clay schist. Others, and among them the majority of geologists, engineers, and chemists agree with Luedecke that the manganese was leached out of the humus-clay stratum by the overflowing river water. This position was hotly contested by the hygienists of the Breslau school, who affirmed that the passage of flood

water into the wells through the overlying clay stratum is a practical impossibility. Debusmann showed that the river water could reach the wells in as short a time as 12 hours when the valley is overflowed. Engineers who have used clay in dams and embankments do not place much faith in the impenetrability of from 7 to 10 feet of alluvial soil. This alluvial soil contained a large percentage of manganese, which Lührig believes was dissolved by ferrous sulphate in combination with free sulphuric acid, produced in turn by the decomposition of ferrous sulphide. As long as the sulphides were not exposed to air they remained unchanged. The lowering of the ground water level brought air in contact with the sulphides, which oxidized to sulphate and free sulphuric acid which dissolved the abundant MnO_2. At the beginning of the calamity the water in the wells was acid to litmus. The acid could act as a solvent largely because the soil is not rich in alkali. The oxidation and solution of the iron and manganese went on for a year and a half, when the sudden overflow caused the appearance of the accumulated iron and manganese in the ground water. Abegg and others thought that diffusion had something to do with the appearance of manganese in the ground water, but D. does not think this explanation adequate, because after a subsequent flood in September, 1906, the amount of iron in the water of the overflowed wells rose suddenly to more than 100 parts per million and the water again became acid to litmus. A measure of the rise in the ground water showed that about 1,325,000,000 gallons of water had seeped into the water bearing layer during this flood. It is not possible to protect the wells against the contamination by iron and manganese during the floods, and several methods of removal were proposed. Lührig and Blasky advised the treatment of the water after deferrization, first with lime followed by aeration, sedimentation, filtration, and finally treatment with carbon dioxide—practically a softening process. Lührig has also recommended the use of artificial zeolite. These processes, however, have not been adopted. Many of the old wells are unaffected by floods and are in use at the present time. New wells have been sunk and a new intake has been installed about two miles above the city. This intake delivers water to the old filters and can be arranged to deliver it to irrigation fields in

which wells have been sunk. Furthermore, the ground in the vicinity of some of the wells has been irrigated with good results and these experiments are being continued. The tendency, however, is to return again to the Oder and purify the water more thoroughly. During the controversy it was affirmed that the manganese might have come from the diluvium, but an investigation by the Prussian Geological Survey into the composition of the soil and water comprising this layer disproved this statement. At present the mixed filtered and ground water contains from 30 to 40 bacteria per cubic centimeter and is satisfactory in every respect.

Klut, H., Dr., "Nachweiss und Bestimmung von Mangan in Trinkwasser." Mit. K. Prnfgs—Anst f. Wasserversorg u. Abwasserbeseit 12, 182–194.

Author mentions most all known methods for the determination of Mn. For the qualitative determination the process of Vohlhard is recommended. To 25 c. c. of the freshly collected water add 10 c. c. of 25% HCl and heat to boiling. Then add 0.5 g. $Pb0_2$ and boil for from 2 to 5 minutes longer. A red color in the liquid after subsidence indicates Mn. The reaction will detect as little as 0.05 mg. per L.

For quantitative work the author recommends the colorimetric method of Vohlhard and Treadwell. Concentrate 200 c.c. of water and 10 c. c. of 25% HCl to 50 c. c. Add 0.5 g. PbO_2 to the hot solution and boil 5 minutes longer. Then filter through a Gooch crucible into a Hehner cylinder and compare the color with that produced by dilutions of a std. solution of $KMnO_4$. For ordinary purposes this method is exact enough but where chlorine and organic matter interfere the water should be evaporated with H_2SO_4, smoked off and ignited. The dissolved residue should be handled as above. Because permanganic acid is decomposed quite rapidly by dust or organic matter, the comparisons should be made with all possible speed.

Where large amounts of Mn were present (over 10 mg. per L.) the Knorrs Persulphate method was proved the best. Evaporate from 5 to 10 liters of water and 5 to 10 c. c. H_2SO_4. Ignite the residue with a very little $KHSO_4$ to destroy organic matter and then dissolve it in hot water. Then boil the solution for 20 minutes in a 200 c. c. Erlenmeyer flask with 5 c. c. dilute

H_2SO_4 (1:3) and 10 c. c. $(NH_4)_2S_2O_8$ solution (60 g. per L.). After cooling, dissolve the MnO_2 in H_2O_2 solution and titrate back with $\frac{n}{10}$ $KMnO_4$. The H_2O_2 solution is standardized against the $KMnO_4$ solution so that 1 c. c. is equivalent to 2.754 mg. Mn.

WATER SUPPLY AND WATER FILTRATION. Anon. Engineering **89**, 173. An abstract of two papers, "Notes on the Sheffield Water Supply and Statistics Relating thereto," by L. S. M. Marsh, and "Statistical and Experimental Data on Filtration," by W. R. Baldwin-Wiseman.

The first paper takes up variation in supply, discharge, loss of head in pipes, fire streams, water hammer, rainfall, evaporation and run-off of the Redmires Catchment Area and the prevention of the action of water upon lead.

The second paper takes up conservation, self-purification, artificial purification, etc. Loss of head of water in passing through sand with formula. Review of modern methods of water purification.

WHAT CONSTITUTES A BAD WATER. Adolph Gehrmann. First Annual Report of the Lake Michigan Water Commission, 1909 (69–72). A classification of the views that have been expressed on the amount of constituents and bacteria that can be present in water and still make it a safe portable water.

THE TREATMENT OF WATER ANTECEDENT TO FILTRATION. Balfour Bramwell. Engineering, **89**, 185. In a letter the writer questions a statement made in an article on the above, that no impurities pass into the sand of a slow sand filter but are all retained in a filtering film on the surface. A few questions are put forth as an argument for the adoption of chemical treatment, coagulation and mechanical filters rather than the slow sand filtration.

AN EXPERIMENT IN CHEMICAL PURIFICATION OF WATER. Adolph Gerhmann. First Report of the Lake Michigan Water Comm. 1909 (120–123). The treatment of a dilute sewage from Bubbly Creek in the Chicago Stock Yards. First passed through a mechanical filter plant and the effluent, which was not in a stable condition, treated with hypochlorite of lime in amounts varying from 2.0 to 0.4 grains per gallon or 12 to 2

parts available chlorine per million. After treatment the effluent found to have a very low bacterial content with B. coli eliminated and the keeping quality of the water satisfactory.

Chemical content of the water in passing through the plant, with the exception of color, Alb. NH_3, and suspended solids, not greatly reduced. In 45 samples the bacterial content ranged from 125,000 to 3,840,000 per c. c. in the raw water with B. coli present in every sample. In the treated effluent the number with the exception of the first sample did not exceed 38 per c. c. and in some cases dropped to 1 per c.c. B. coli was found in only two samples of the 45. Examination of the city supply carried on simultaneously showed counts varying from 55 to 1376 per c. c. with B. coli present in 43 of the 45 samples.

WATER SUPPLY AND CONDITIONS OF LAKE MICHIGAN FROM THE CALUMET RIVER TO HOWARD AVENUE, CHICAGO. J. F. Biehn. First Annual Report of the Lake Michigan Water Comm. 1909, (109–119). The investigations show a gradual diminution in the degree of pollution as the distance into the lake increases, the degree of pollution being determined by bacterial counts on agar and the presence of the typical B. coli.

As many as 66,000 bacteria per c. c. were obtained south of the Calumet River while four miles out a count as low as 8 per c. c. was obtained. No B. coli were found in samples collected four miles out, some were found in part of the samples taken three miles out, also in some of the samples collected at each place two miles out and in practically all samples collected within the one mile limit.

From the results two zones of pollution were established, a zone of constant pollution within which B. coli were found in all samples. This zone extended out somewhat over a mile on the average, being much wider off the dumping ground and off the Calumet region where large amounts of sewage and manufacturing wastes are thrown into the lake.

A zone of occasional pollution extending about a mile beyond the constant zone.

Beyond the four mile limit apparently no pollution exists.

The Carter H. Harrison and the two mile cribs are surrounded by a zone in which B. coli are found in 60% of the samples.

The pollution of the lake between the limits named appears to come from four sources, the Indiana cities, the southern end of Chicago and the Calumet region, the shipping and the cities on the north shore. The author believes that the accumulation of sewage sediment during the past years tends to keep up the pollution along the north shore.

Results of examinations of water from the various pumping stations show B. coli present in a large percentage of samples varying from 76% in water from cribs within the two-mile limit to 48% in water from the four-mile crib, the average being 73%. The quantitative count on agar showed an average number varying from 116 in water from the Lake View crib to 70 from the four-mile crib, the mean of all being 94.7 per c. c.

The number of bacteria found in the cribs were found to be 500% greater than in the water outside, while the number in the water at the pumping station were less than outside the crib. This extraordinary increase in the crib was due to dead fish, large numbers of which were being constantly removed. The decrease at the pumping station was due to passage through the tunnels. It was found that the difference in the number of bacteria at two pumping stations each taking their supply from the same source was between 50% and 70%, the lower number being found at the inland station, the tunnel to this station was two miles longer than to the other. Examination also showed a reduction of 35% in two miles of mains.

Examination of the Chicago River at the most polluted point showed B. coli in all samples and agar counts varying from 46,000 to 8,000,000 per c. c. while at the mouth the count dropped to 280 to 3000 per c. c.

Examination of the Calumet River and its branches gave counts as high as 8,000,000 per c. c. with B. coli present in all samples.

THE CHARACTER OF THE WATER SUPPLY OF MICHIGAN CITY, IND. H. E. Barnard & J. H. Brewster. First Annual Report of the Lake Michigan Water Comm. 1909. (136–189).

Lake Michigan Water except where polluted is a clear. colorless water with very little organic matter. The only currents affecting the intakes of the Michigan City supply are those

caused by winds. At times these currents are into the harbor and creek which receive all of the sewage of the city and at these times no harbor water finds its way into the Lake. At times of freshet or off shore winds there may be a strong current out of the harbor causing a discharge into the lake of all the stored up filth.

The causes of pollution of the southern end of the lake are:

Discharge of harbor water into the lake.
Shore wash.
Dumping of dredged material.
Shipping.
Disturbance caused by sand dredges.

To offset this pollution are:

Dilution.
Sedimentation.
Lack of organic matter necessary for bacteria growth.
Sterilizing action of sunlight.

The city received its supply from the lake but occasionally during the winter when the intake becomes clogged with ice the supply is taken direct from the harbor. The harbor acts as a huge settling basin.

Analyses of the water at the harbor intake of the water supply and at the mouth of the harbor show a reduction in total solids of 260 to 138, volatile solids 80 to 16, free NH_3 0.280 to 0.016, nitrites 0.060 to 0.002 and chlorine 15 to 4 parts per million. The bacterial examination shows a decrease from 52,500 per c. c. at the Fourth St. sewer to 40 per c. c. at the east end of the breakwater.

The investigation showed that the lake intakes gave a safe wholesome supply but the occasional use of the sewage ladened harbor water and the use of wells of which nearly 50% of those examined were found polluted, were the cause of the high typhoid, the high rate in the winter and spring being directly caused by the use of harbor water.

The tables and charts giving the results of chemical and bacterial examinations show the movement of the sewage in the harbor and lake and the condition of the lake surrounding the intakes.

PUBLIC HEALTH LEGISLATION, NEWS AND NOTES.

By FRANCIS H. SLACK, M. D.,
Director, Boston Board of Health Laboratory.

A NATIONAL DEPARTMENT OF PUBLIC HEALTH.

(S. 6049, Sixty-first Congress, second session.)

In the Senate of the United States. February 1, 1910. Mr. Owen introduced the following bill, which was read twice and referred to the Committee on Public Health and National Quarantine:

A bill establishing a department of public health, and for other purposes.

Be it Enacted, etc., That there is hereby established a department of public health under the supervision of the secretary of public health, who shall be appointed by the President a Cabinet officer, by and with the consent of the Senate, at a salary of $12,000 per annum, with like tenure of office of other Cabinet officers.

Sec. 2. That all departments and bureaus belonging to any department, excepting the Department of War and the Department of the Navy, affecting the medical, surgical, biological, or sanitary service, or any questions relative thereto, shall be combined in one department, to be known as the department of public health, particularly including therein the Bureau of Public Health and Marine-Hospital Service, the medical officers of the Revenue-Cutter Service, the medical referee, the assistant medical referee, the surgeons and examiners of the Pension Office; all physicians and medical officers in the service of the Indian Bureau or the Department of the Interior at old soldiers' homes, at the Government Hospital for the Insane, and the Freedman's Hospital and other hospitals of the United States; the Bureau of Entomology, the Bureau of Chemistry and of Animal Industry of the Department of Agriculture; the hospitals of the Immigration Bureau of the Department of Commerce and Labor; the emergency relief in the Government Printing Office, and every other agency of the United States for the protection of the health of the people United States, or of animal life, be, and are hereby transferred to the department of public health, which shall hereafter exercise exclusive jurisdiction and supervision thereof.

Sec. 3. That the official records, papers, furniture, fixtures, and all matters, all property of any kind or description pertaining to the business of any such bureau, office, department, or branch of the public service is hereby transferred to the department of public health.

Sec. 4. That the secretary of public health shall have supervision over the department of public health, and shall be assisted by an assistant secretary of public health, to be appointed by the President, by and

with the advice and consent of the Senate, at a salary of $6,000 a year, with such duties as shall be prescribed by the secretary not inconsistent with law.

SEC. 5. That the secretary of public health shall be authorized to appoint such subordinates as may be found necessary. There shall be a chief clerk appointed, at a salary not to exceed $3,000 a year, and such other clerks as may from time to time be authorized by Congress.

SEC. 6. That the officers and employees of the public service transferred to the department of public health shall, subject to further action by Congress, receive the salaries and allowances now provided by law.

SEC. 7. That it shall be the duty and province of such department of public health to supervise all matters within the control of the Federal Government relating to the public health and to diseases of animal life.

SEC. 8. That it shall gather data concerning such matters; impose and enforce quarantine regulations; establish chemical, biological, and other standards necessary to the efficient administration of said department; and give due publicity to the same.

SEC. 9. That the secretary of public health shall establish a bureau of biology, a bureau of chemistry, a bureau of veterinary service, a bureau of sanitary engineering, reporting such proposed organizations to Congress for suitable legislation relative thereto.

SEC. 10. That all unexpended appropriations and appropriations made for the ensuing year shall be available on and after July 1, 1910, for the department of public health, where such appropriations have been made to be used by any branch of the public service transferred by this act to the department of public health. It shall be the duty of the secretary of public health to provide, on proper requisition, any medical, sanitary, or other service needed of his department required in another department of the Government.

SEC. 11. That any other department requiring medical, surgical, sanitary, or other similar service shall apply to the secretary of public health therefor wherever it is practicable.

SEC. 12. That all officers or employees of the Government transferred by this act to the department of public health will continue to discharge their present duties under the present organization until July 1, 1910, and after that time until otherwise directed by the secretary of public health or under the operation of law.

SEC. 13. That all laws or parts of laws in conflict with this act are hereby repealed.

The Hon. Robert L. Owen, of Oklahoma, delivered an able and convincing argument in favor of the above bill, March 24, 1910, in the U. S. Senate. Mr. Owen has behind him in this movement the combined strength of the American Public Health Association, The American Medical Association, and all progressive health organizations of the country.

It is difficult for those familiar with the situation to understand the animus for opposition to this desirable legislation, looking as it does for the better health and necessarily better economic condition of the people of these United States.

Senator Gallinger's (N. H.) frequent interruptions and questions during the course of Senator Owen's speech may have been for the purpose of bringing out more clearly and in greater detail the benefits of the proposed department. If so, they served the purpose admirably.

Such a department should work without friction with existing health organizations in the various states and should serve to exalt preventive medicine to that high position it should occupy in a civilized country.

RED PLAGUE SOCIETY OF CALIFORNIA. In April, 1909, there was organized at a meeting of the California Public Health Association, a daughter society appropriately named the "Red Plague" Society of California, since its object is to popularize knowledge concerning those two great scourges, Syphilis and Gonorrhoea, which owe their hold on humanity to the special vices of the so-called "Red Light" districts of our cities. The April, 1910, Bulletin of the California State Board of Health is especially devoted to a discussion of this subject and contains an article by the Executive Officer of the Board, Dr. Wm. F. Snow, urging a nation wide campaign of education and the development of effective legislation to meet the situation.

The system hitherto followed of forbidding teaching concerning these diseases and of considering it evidence of impurity to have knowledge concerning them has been exceedingly fruitful in allowing a wide-spread infection of our population.

Teaching concerning tuberculosis, its causes and prevention, has in recent years been popularized to such an extent that very few are ignorant concerning the essential factors of this disease. As a result people have shown themselves eager to follow proper methods of living as a protection from the dangers of the great white plague. Surely they will not much longer be content to suffer untold miseries from the ravages of this greater plague of venereal diseases now that socities are springing up throughout the country which, like the California society, make it an

object to disseminate the facts concerning these preventable diseases.

For the safety of the public such knowledge should be widespread and these diseases should be reportable. There is too much prudery and hypocrisy along this line. In school our children are taught many subjects of less value than these vital ones concerning their health and well-being. At church they listen to flowery figures of speech and religious platitudes but the right-teaching and true religious service is denied them when we withhold those teachings concerning sexual matters which are necessary, making a mystery of things which should be carefully taught and especially when we neglect to warn them of unseen and terrible foes which, though easily avoidable by those with knowledge, are dragging thousands upon thousands through a miserable existence of disease and shame.

It is significant that the formation of this Californian society is due to the efforts of a woman. It is appropriate that women should take the front and force this battle against foes from which they are the greatest though often innocent sufferers.

The campaign of education concerning venereal diseases has begun. Such a campaign deserves and should receive the support of all informed persons. However profitable in the saving of life and the minimizing of suffering the campaign against the great white plague has been, it would seem that a much greater benefit may be conferred upon humanity by a well directed crusade against the twin evils, syphilis and gonorrhoea.

THE COMMON HOUSEFLY receives the full attention of the Kansas State Board of Health in their monthly bulletin for April, 1910. The Kansans who have already been saved from the dangers of the common drinking cup through the energies of their State Board of Health, are now given timely and complete information concerning this great disease carrier and common nuisance (the musca domestica).

They also publish and recommend for adoption by cities and towns the following ordinance, with credit to the Indiana State Board of Health:

AN ORDINANCE to protect the public health against disease and poisons carried by flies.

WHEREAS, It is commonly known that flies are very dangerous carriers of filth, filth poisons and disease germs, that they are born in filth and are a constant threat against the health, happiness and prosperity of the people; therefore,

SECTION 1. Be it ordained by the mayor and council of the city of ————, that it shall be unlawful for any person, firm or corporation to suffer or permit or have upon their premises, whether owned or leased by them, any one or more of the following unsanitary fly-producing, disease-causing conditions, to-wit: (1) Animal manure in any quantity which is not securely protected from flies; (2) privies, vaults, cesspools, pits or like places, which are not securely protected from flies; (3) garbage in any quantity which is not securely protected from flies; (4) trash, litter, rags or anything whatsoever in which flies may breed or multiply.

SEC. 2. It shall be the duty of the chief of police or city marshal and health officers, upon learning in any way whatsoever of the existence of one or more of the unlawful conditions described in Section 1 of this ordinance, to notify the offender in writing, upon order blanks provided by the city clerk, to remove or abate said unlawful conditions, stating the shortest reasonable time for such removal or abatement. In the event of the refusal or neglect on the part of the notified offender to obey such order, the chief of police or health officer shall inform the street commissioner, upon a blank provided by the city clerk, and it shall then be the duty of said street commissioner, and he shall have power and authority, to remove and abate the reported unlawful conditions; and he shall keep an accurate account of the cost and expenses thereof, which shall be paid from the city treasury upon the sworn vouchers of the street commissioner, and said cost and expenses shall be a lien upon the property and shall be collected by law as taxes are collected and duly paid into the city treasury.

SEC. 3. Any person, firm or corporation found guilty of having created or suffered to exist on premises either owned or leased by them any one or more of the unlawful conditions named in Section 1 of this ordinance shall be punished by a fine of not less than five nor more than fifty dollars.

SEC. 4. All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed; and whereas an emergency exists, this ordinance shall be in effect upon and immediately after passage.

DR. HERBERT D. PEASE AND A. J. PROVOST, JR., have been appointed to succeed Dr. Ernst J. Lederle as sanitary experts for the Board of Water Supply of New York City.

BOOK REVIEWS.

The Origin and Prevalence of Typhoid Fever in the District of Columbia. Bulletin No. 52. Hygienic Laboratory, U. S. P. H. and M. H. S., 1909.

To the epidemiologist this the third bulletin on this subject is a rare treat of facts, figures and logical deduction therefrom as concerns the *prevalence* of the disease. But its *origin* is not accounted for. The authors eliminate all imported cases, and of the remainder regard 20% as secondaries and 10% as milk infections. Eliminating the secondaries because immaterial to the question of origin, 88% of the true native primaries remains a mystery.

No one can do otherwise than most sincerely praise, even with envy, the wealth of detail in the investigation, the care in arrangement of data, the skill in interpretation, even though one remains nonplussed that at the end of the third year of investigation, the problem is still "unsolved."

Let us confess that we were prejudiced against the hypothesis that water was responsible in Washington, that we wanted to believe milk, contact, flies, food, carriers, etc., would prove all sufficient, that we approached the reading of this volume with the belief that this was the conclusion it would show. Yet before opening the maps or considering the analytical tables in detail, the reading of the text itself indicated that water only could account for it.

We turned to the authors' own conclusions—here would be the key which we had fallaciously hoped to find by our own unaided deductions from the data. Alas! flies, food, milk, servants, contact, oysters, everything is considered, all are eliminated, water is left. Then water is rejected too; nothing is left and that terrible 88% of native primaries unaccounted for remains, except for the hypothesis of some new factor not yet accepted or even guessed at by epidemiologists.

It is true that the authors admit the water as the objective of all the epidemiological straws. But they do not accept it,

because the water was of good sanitary quality, as judged by present standards. *Perhaps our standards are wrong.* Let us theorize a little.

First, the Washington water is sedimented before filtration, and so far as the very scant figures given permit any deduction, the larger percentage of such bacterial purification as is achieved occurs during sedimentation. The subsequent purification by the filters *as judged by the percentage removal* of the bacteria *left after sedimentation* is not consistently good.

What is the theoretical effect of sedimentation? Judged by the laboratory technique employed to secure pure cultures of typhoid bacilli from feces (p. 114 of this report) sedimentation (in the laboratory) is expected to get rid of the non-motile and slow moving bacilli (including the colon bacillus) and leave in the supernatant liquid the actively motile bacilli, including the typhoid organism. If this occurs in sedimentation basins on a large scale as it is supposed, with reason, to occur in the laboratory on a small scale, then a low count and absence of colon bacilli from a filter effluent where sedimentation precedes filtration does not mean the same degree of typhoid purification as it does when preliminary sedimentation is not operative. To follow this hypothesis for a moment, sedimentation may be a method of removing the bulk of the bacteria of the raw water, but not a proportionate bulk of the typhoid bacilli. The subsequent filtration, attaining a direct removal of only 60–90% of these, (the figures showing the percentage removal are very few) would not be enough to ensure safety. Remember that to supply 376 cases from a population of over three-hundred thousand persons in six months means only that out of one hundred and eighty million drinks of water taken (at three drinks per head per day) only 3760–7520 need be badly infected, for basing our estimates on not over the usual rates, about 5—10% of those infected succumb. Ten thousand infected drinks out of 180,000,000 means only that one glassful in every 18,000 is seriously infected. Is it hard to believe that this much infection from the Washington water may occur when colon bacilli and gas-producing organisms are not infrequent in the effluent and in the tap water? Is it not easier to believe this than any other hypothesis?

Again, the reduction in typhoid death rates of most American cities in which purification by filtration has been installed do not compel the unprejudiced critic to expect perfection of them. Clark and Gage showed that the general bacterial efficiency must be very high (98 or more %) to secure any colon efficiency, or by inference typhoid efficiency worth mentioning. Analytical work personally known to the writer shows that colon bacilli admitted to mains may remain to contaminate the tap water for three months; and epidemiological work done personally by the writer shows that typhoid bacilli admitted to mains probably survive about one month. It is exceedingly suggestive that our authors found the analytical results f om the tap water notably worse than the average of those made on the filter effluent.

Again, any filter may "break", and if this coincide with the presence of typhoid in the applied water, the mains become infected and as above stated we have evidence that the typhoid infection so admitted to the mains may remain a month in the mains. One such "break" per month may keep up a slight but continuous infection of the mains sufficient to produce one case per thousand population in every six months. There is evidence that such "breaks" occur in Washington. Perhaps coagulants, urged by the engineers from the first, would prevent these, as they were intended to do. Of that let them speak.

We believe that a pure water supply should be absolutely pure all the time if typhoid is to be eliminated, and we do not believe that approximate purity for part of the time is sufficient. Strenuous measures alone will purify a water recently contaminated. Nature provides certain broad general methods—time, sunlight and natural filtration, among the best. He who would imitate Nature must imitate the best and most perfect samples of her work: for Nature botches nine-tenths of her results through imperfect facilities.

A sagacious suggestion has been made to settle the question of Washington typhoid by hypochlorite treatment of the water. This, properly carried out would eliminate, without much cost, all doubts concerning the water. If it be found that Washington typhoid does not very materially decrease under such treatment, then it will be time to look for the fourth dimension in typhoid

epidemiology—the unknown-factor hypothesis, which our authors hesitatingly suggest. The sum of $5000 thus expended for six months would not alone determine the responsibility of the Washington supply itself, but would clear up an epidemiological question of the highest importance to the South as well as to the North.

In conclusion the writer wishes to make clear his belief, i. e., that the vast majority of the true native primary cases of typhoid fever in Washington otherwise unaccounted for are due to infection conveyed to them by the Washington water; and he bases this conclusion entirely on the figures presented in this report. He has nothing but the most sincere praise for the investigative work done, and in fact criticizes nothing concerning the report itself except the failure to draw what seems to him the only logical conclusion from the figures.

H. W. HILL.

[Minn. State Board of Health.]

The Water Supply, Sewerage and Plumbing of Modern City Buildings, by WM. PAUL GERHARD, C. E., N. Y. *John Wiley & Sons, First Ed., 493 ps., 214 cuts, 25 diags. and tables, 1910.*

This excellent, practical manual by an engineer who has already published about twenty books and papers bearing upon some branch of Sanitary Engineering, is the outgrowth of various lectures and essays on the "Water Supply of Buildings" and on "Plumbing" previously delivered or written. The chapter headings are as follows:

Chapter I presents in an elementary form the essentials of the sanitary and hydraulic work of modern buildings.

Chapter II discusses sanitary fixtures and appliances.

Chapter III explains advanced and simplified plumbing methods, and in connection therewith gives suggestions for vital improvements tending to modify and simplify the present methods which are not in the author's judgment altogether satisfactory. For many years he has striven for the simplification of complicated plumbing systems, and is reaping the reward of see-

ing his ideas gradually coming into practice. He stands first and foremost for simplicity and safety.

Chapter IV deals with plumbing in its public health aspect, and with the municipal control of plumbing. In this chapter the modern views concerning the character of sewer air are carefully discussed, and the author pleads for well arranged plumbing even though he believes that sewer air is not a discernible cause of disease.

Chapters V and VI deal with the problems of the supply of water to residences and modern high buildings respectively.

Chapter VII has to do with the maintenance of pipe systems and is prepared chiefly for the managers of institutions and buildings.

Chapter VIII contains a complete set of rules representing the author's idea of the best modern practice regarding plumbing, water supply, and sewerage.

In Appendix A there is an excellent glossary, and in Appendix B there is an excellent account of the history of the development of the art of drainage and plumbing of habitations.

Appendix C contains a plumbing specification reminder and a collection of several hundred reminders which will be found useful in the preparation of plumbing specifications, and which are the outcome of nearly thirty years practical experience.

The illustrations of this book are excellent and modern, and all of them show in an admirable way the present state of the art. Especially serviceable both as to kind and arrangement are the hydraulic and other diagrams and conversions tables, many of which are original and many are drawn from unusual sources. The book is rather elaborate in places, and some of the chapters might be condensed. There are many repetitions which the author states have been made purposely in order to have each chapter complete in itself. The book is true to its title and is a description of methods and appliances rather than a treatise on the hydraulics of water piping and plumbing. One could have wished more detailed information on certain subjects. For example, the effect of bends on the flow of water and sewage in small pipes, and the consumption of water for different purposes in families and in office buildings. Such subjects as water purification and sewage disposal have been treated in other books by

the author and are only mentioned in this work. It is eminently a book for engineering and architectural students, plumbers and others, but it is so well and so clearly written that it could be read profitably by anyone interested in the sanitary arts. The subject matter indicates careful and thorough work and the reviewer knows of no book on the subject so practical as this.

R. S. WESTON.

Guide to Sanitary Inspections. By WILLIAM PAUL GERHARD, C. E., Mem. Amer. Soc. Mechanical Engineers. *Fourth Edition, entirely revised and enlarged. Cloth. Pp. 229. New York: John Wiley & Sons. 1909.*

No class of people in any community gives more concern to the health officer than those persistent citizens who send in a steady stream of complaints concerning the back yards of their neighbors and concerning what they regard as the insanitary and dangerous condition of the houses in which they themselves live. The houses thus complained of are always, by the way, rented houses and usually houses for which the complainants wish to cancel their leases. According to this class of citizens, a floor in bad repair, a poorly-drained back yard, a broken fence, or wall paper which has not been renewed for several years is a constant menace to the health of the family, and any one of these conditions (of which there are a hundred more in the same class) may, in their opinion, give rise to practically any malady with which the human race is afflicted, though typhoid fever, malaria, smallpox and cholera seem to be the ailments most commonly dreaded in this connection. Such persons make the life of the health officer miserable and seriously interfere with his usefulness by consuming a large part of the time which he could profitably devote to the real problems of his department.

It was therefore with a profound feeling of thankfulness that Mr. Gerhard's "Guide to Sanitary Inspections" was opened; for, it was argued, here is a book, of convenient size and small cost, which may be placed in the hands of sanitary inspectors, so that they may learn the real place of sanitary inspections, and which, in selected instances, we may even recommend to the citizens

themselves, in order that they may have authoritative confirmation of the health officer's position that ninety-nine times out of a hundred the things of which they so vehemently complain have little or nothing to do with their health, however much they may have to do with their esthetic sensibilities and with their desire to get even with the landlord.

The opening paragraph quotes what the writer says is a recent statement (authorship not given): "Of all the buildings put up in the United States, not one in a hundred is made to submit to any official regulation. The local government knows nothing of the plans of the builders or architects: there are no sanitary regulations.* * * * * No wonder that malaria and disease are common throughout the country!" What a striking manner of introducing the subject, we thought, by making the issue right at the start and showing how exaggerated and silly are popular conceptions of the origin of disease—a fine way in which to lead up to a rational exposition of the real place occupied by sanitary inspection to-day, in the light of accepted sanitary knowledge.

But alas! It rapidly becomes apparent that this is the position of the author himself; for on page 5 he quotes with entire approval the following: "The wisdom of not entering upon residence in any old house until its healthy (*sic!*) condition is vouched for by some competent authority, it would be a work of supererogation to affirm, seeing how many sicken and perish for want of the most ordinary care in this respect. In town and in country alike, when this precaution has been neglected, Nemesis, in the form of some indisposition or another, is *certain* (italics ours) to overtake the careless occupant. This axiom is, unfortunately applicable to modern houses built in the present decade, as many a sorrowing heart can testify."

By this time we are brought to realize that the author is really serious in such beliefs. Page after page, by quotations and by his own statements, the author takes the firm stand that insanitary dwellings occupy the very first place as a cause of disease and death. At this point the reader is forced to one of two conclusions: either the author simply adheres to doctrines which, always obscure and ill-defined, have finally been almost completely abandoned by sanitary authorities of

to-day, or else he has gone further than others and discovered additional evidence in the case and is prepared to prove that there is in fact more in these things than is recognized by present-day sanitary science. If the former be true, then this "sanitary guide" is hopelessly out of date; if the latter be the true explanation, then the author should realize that he has a new message of the utmost importance to all public health workers, and it becomes his plain duty to enter very fully into an account of just what diseases are "certain" to overtake the man who is rash enough to live in a house which has not been thoroughly inspected by a sanitary expert and to explain just how the dire results are brought about. He cannot be relieved of this plain duty by the disclaimer in his preface, in which he pleads the necessity for brevity in explanation of why "it was not feasible to give in detail the reasons why certain constructions or arrangements are deemed to be defective and unsanitary."

If the theories of the author were applied by him to tenements and hovels alone, much that he claims would be admitted, but he expressly states, over and over again, that what he says applies equally to the finest class of dwellings in our cities.

Were the author unknown, or were he not known as a man of recognized ability along just the lines treated of in his book, it would be impossible to escape the conclusion that his views on many points were hopelessly muddled. For example, although throughout the volume the old bogy of "sewer gas" is not held up as the cause of endless human ills, and although he is careful to explain that there is in reality no definite substance properly called sewer gas, and although he sedulously avoids the use of this term and substitutes for it "sewer air," still, while giving up the older term, itself, he accredits "sewer air" with most of the malevolent effects formerly attributed to its predecessor. One of the reasons why sanitarians substituted the term sewer air for sewer gas was their recognition of the fact that so deep-rooted were the fallacious ideas concerning the evils of sewer gas that the name itself, as well as the conceptions as to its evils, would have to go. To use the term sewer air and then attribute to this all the evils formerly associated with sewer gas would soon necessitate the abandonment of the newer term. In numberless places the evils of sewer air are given great promi-

nence in the present volume, but the most extreme illustration of the position taken by the author is where he states (page 25): "Pan-closets, found even to-day in finer houses, with otherwise good plumbing-work, are *generators of sewer air* (italics ours.) Comment is unnecessary.

Discussing the water supply of country homes, the author states that "as a rule, a qualitative analysis is sufficient to throw light upon the unwholesomeness of a suspicious water; in more important cases, however, a quantitative analysis should also be performed." It would be interesting to know what substances, detectable by sanitary chemical analysis, are found in a polluted water and are not present in ordinary waters which are entirely wholesome. Such simple qualitative tests would be a godsend to water analysts of to-day, who are coming more and more to realize the weakness of even the most careful and thorough sanitary chemical analyses, and who certainly make such deductions as they are willing to make at all from analytic data only after most painstaking consideration of the actual and relative amounts of substances contained in practically all waters.

Regarding disposal of sewage from a country home, the author advocates as a perfectly safe and satisfactory method, the use of a tight sewage tank, from which the accumulated sewage may "be pumped by means of an ordinary garden pump with hose attached, and then distributed in the vegetable garden." Rather remarkable that vegetables thus fertilized should be innocuous to individuals so sensitive that they are made ill by living in a house situated on made land or by the odors from a manure heap!

In the last pages of the volume, the author evidently fears that, in spite of all the warnings of the mysterious, though none the less inevitable and fatal, afflictions which are "certain" to overtake the dweller in a house which has not undergone a rigid sanitary inspection, the reader may not yet have been sufficiently impressed with the gravity of the situation and may, perchance, be bold enough to imagine that he can himself properly inspect the dwelling which he is about to occupy. But say not so! *Real* sanitary inspection of a house is a serious matter. No room for doubt is left on this point, for, says the author: "If in making a sanitary house-inspection, it is con-

sidered impracticable to remove tight woodwork, rip up floors, cut up walls, dig holes, so as to clearly expose every fixture, trap, and every foot of waste or ventpipe, and to gain access to the interior of drains, or to make sure that no old cesspools exist under a house, the results of the examination will enable the inspector to make a general or preliminary report only."

And even this is not all, for the author tells his now thoroughly alarmed reader that he desires "in conclusion to emphasize the necessity of a *periodical* inspection of the sanitary condition of all kinds of buildings. It is not sufficient to spend once a large amount of money to put the sanitary arrangements in a good condition. Constant supervision and thought are required to keep everything in good order.

One cannot but close this remarkable book with the horrible realization that unless he is able to employ ("retain" might be a better word) a sanitary expert to tear down his house, rebuild it and then stay constantly on the job of inspecting it forever thereafter, he had best take at once to the woods and live in no house at all. But stay, there is after all another solution of the problem—the one at which it is hoped that ninety-nine out of every hundred readers will most probably arrive. What this more consoling view of the whole case is may safely be left unstated.

The perusal of Mr. Gerhard's book leaves one more than ever convinced of the necessity for some safe, sane and modern compend on sanitary inspections. This class of work will always be required of health departments in our cities, and it has a distinct and decided field of usefulness. We no longer dread sewer gas as did the last generation of sanitarians, but we none the less continue to insist on proper plumbing, for reasons which it would be the function of such a work to state. We know that it is absurd for anyone to complain of uncut weeds in his neighbor's lot on account of the noxious effluvia which arise from them and which he fears may give him malaria, but these same uncut weeds are bad nevertheless, for they nearly always serve as a hiding place for many old tin cans (thrown there, most likely, from his own kitchen), and these, collecting water after each rainfall, serve as excellent breeding places for mosquitoes, some of which may be the malaria-bearing anopheles. We laugh at the man

who complains that "the odor from the stable across the street is enough to give us all typhoid fever." But only his theory is wrong and not his facts; for the odor of which he complains is due to decomposing horse manure, and this is the ideal breeding place for flies, which may in fact bring typhoid fever into his home.

It is greatly to be hoped that someone with clearcut views on matters such as these, and with the ability to express these views in a fashion so simple and yet so attractive as to appeal to the general public and to the sanitary inspectors of municipal health departments, will soon fill the need now existing for a rational "Guide to Sanitary Inspections."

E. C. LEVY.

The Science of Living, or The Art of Keeping Well. By WILLIAM S. SADLER, M. D. *Chicago, A. C. McClurg & Co., 1910.*

This is a semi-popular work in the field of general hygiene. It is of unusual scope and detail. The amount of information compressed into it gives evidence of exceedingly careful selection of material. Possibly there is too much—the rapid succession of topics and precepts tending to bewilder the reader. But the merits of the book are many. Its order and proportion are excellent. The writer shows independence in observation and suggestion without being eccentric, and he rarely rides a hobby. If we detect one at all it is "high-blood pressure." The estimate placed upon mental factors in health is fair and temperate. The subject of nutrition is treated ably and the tables relating to dietaries are novel and interesting. A penchant for striking statistics seems to be a foible of the author but it is not often too prominent. We believe his figure for the number of cells in the human body is one which originally stood for the number of corpuscles in the blood; perhaps the string of ciphers is sufficiently impressive but it is well to be accurate. It would be quite unjust to make much of the inevitable flaws in the book; it will not mislead its readers but will rather prove practical and helpful beyond most of its competitors.

PERCY G. STILES.

Principles of Hygiene: For Students, Physicians, and Health Officers. By D. H. BERGEY, Assistant Professor of Bacteriology, University of Pennsylvania. *Third Revised Edition. 555 pp. Philadelphia and London. 1909.*

The third edition of Bergey's Hygiene shows considerable changes by comparison with the volume issued five years ago. In particular, the chapters on sewage disposal and on immunity have been extensively enlarged and rewritten and new discoveries, such as those relating to the etiology of plague and syphilis, have been incorporated.

The reviewer is inclined to believe this one of the best, if not the very best, textbook of hygiene in the English language. Every year, however, the idea of any single book, or course of lectures, covering such a subject as "Hygiene," becomes more and more anomalous. The wide field of public health work, with which this much misused word is held to be synonymous, covers medical subjects like personal hygiene and the control of the communicable diseases; bacteriological subjects like immunity, and water and milk examination; chemical subjects like air and water analysis; purely engineering subjects like water purification and the disposal of sewage and garbage—and vital statistics. It is clearly impossible to treat any one of these five distinct classes of problems satisfactorily in less than a single book, while many of their minor subdivisions require large volumes for satisfactory elucidation. The time must some day come when medical schools will abandon the fruitless attempt to teach a smattering of the details of a dozen different sciences under the name of "hygiene," substituting a course in the broad principles of sanitary science, for the ordinary practitioner, and a really valuable graduate course for the public health specialist. Prof. Bergey in the present volume has minimized the evils of the prevailing type of book to a very considerable degree. He says in his original preface: "No attempt has been made to treat the subject in an exhaustive manner, the object being merely to give the general principles upon which the health officer and the physician work in their respective capacities in dealing with conditions which are detrimental to health or which tend to

improve health." The peculiar value of the book lies in the fact that the author has succeeded to an unusual degree in confining himself to general principles. Nevertheless, the bulk of the volume is still concerned with details, calculations of cubic feet of air space, chemical analyses of water, construction of sewage disposal plants, dietetic formulae, school seats, vaccination against specific diseases, etc. The shortcomings of a book of this type are not the fault of the author but are to be charged to the tradition which demands that medical students shall be made to believe that they have a knowledge of public health practice, (as opposed to public health principles), a knowledge which they cannot acquire without prolonged and specialized study in various fields.

Coming to specific details, air supply and ventilation are among the best handled of all the subjects in the book. It might be well to make clearer the importance of temperature and humidity in producing the lowered vitality associated with bad air; and Professor Bergey's statement that small amounts of carbon dioxid depress vitality and that the bad effects of respired air are in part due to this gas seems to require substantiation. The testimony of the best experts in England and Germany, as summarized for example in the recent reports of the Royal Commissions on Factory Ventilation, points to heat and moisture as the chief, and perhaps the only, well-established properties of bad air.

The chapters on sanitary engineering are less satisfactory. The author does not appear to distinguish clearly between the fundamental aim of water purification, which is the straining out of bacteria, and the fundamental aim of sewage purification, which is the oxidation of organic matter. The reduction in nitrogenous matter in a water filter, figures for which Prof. Bergey quotes, is quite beside the point. Under garbage, high temperature destructors, which now occupy the center of the stage, are not even mentioned, and some very dubious cost data are quoted. The treatment of chlorin disinfection of water is naturally out of date, for the last two years have revolutionized water works practice in this regard. There are apparently clerical errors on p. 157 where it is stated that sewage is composed of "998 parts of water, 1 part of urine, and 1 part of

organic matter," and on p. 168 where the number of persons to an acre of sewage irrigation area is given as 2,000.

Professor Bergey's general treatment of dietetics and the hygiene of feeding is well done. The most surprising thing in this chapter is that under milk the word Pasteurization seems not to be mentioned. It certainly does not appear in the index. Yet cities are turning more and more to pasteurization as one of the most useful practical methods of dealing with this problem; and the home pasteurization of baby milk is certainly an indispensable part of infant hygiene.

The chapters dealing with exercise and clothing and personal hygiene seem to the reviewer excellent. The chapters on Industrial Hygiene and School Hygiene are also well done. From the former, a table of average age at death in various occupations, which is not a useful form of statistical statement, might well have been omitted, however.

The treatment of Immunity, in Chapter XVII is an exceptionally fine piece of work. Into ten pages of text Professor Bergey has compressed a really admirable digest of the fundamental principles of immunology and in the rest of the chapter he gives a careful and timely review of most of the recent practical advances in this science. In this same chapter is a table giving the etiologic factor, avenues of entrance, sources of infection, modes of dissemination, and preventive measures for thirty-eight acute infectious diseases, which ought to be radically revised in another edition. Direct contact, now recognized as of such supreme importance, appears as a source of infection only under scabies. "Fomites and infected dust" is given as the source of infection for Pneumonia and Tuberculosis, and Fomites alone for Diphtheria, Erysipelas, Cerebro-spinal Meningitis, Influenza, Small-pox, Measles, Scarlet Fever, Mumps, Whooping Cough, Carbuncle, Favus, and Varicella. Perhaps Prof. Bergey means to include under fomites, handled food, drinking cups, mouth spray and other forms of more or less direct contact. In the ordinary sense in which the word is used, however, it implies remote transfer by inanimate objects, such as bedding, clothing, etc.; and in this sense its importance is rapidly dwindling almost to disappearance. The chapter on disinfection is well handled; but in regard to isolation and quarantine it seems unwise to devote 67

pages to the full text of quarantine laws and only 2 pages to the really important problem of house quarantine, (or isolation).

On the whole, the book is an excellent one, for the most part accurate, well proportioned and judicious. Professor Bergey has produced a treatise on hygiene which is perhaps as good as any book can be which attempts the task of treating such a vast and diverse range of subjects in a single volume.

C.-E. A. WINSLOW.

Primer of Sanitation. By JOHN W. RITCHIE, Professor of Biology, College of William and Mary, Virginia. *Illustrated by Karl Hassman. Yonkers, N. Y. World Book Co., 1909.*

The reviewer is wholly unacquainted with any book of its kind in the English language that addresses itself with such brilliant success to those for whom it is designed.

The manner of the plan of presentation of the subject matter is so logical throughout that it would be hard to suggest any improvement.

Beginning with the first chapter, it is shown why the study of bacteria and diseases are so necessary; the second chapter deals with the cellular structure of the human body; the third with how germs enter the body; the fourth with the struggle between the body and the invading bacteria; and succeeding chapters with discussions on bacteria in general and in particular; how to avoid disease; how to care for the sick; how to prevent the spread of disease; protozoal diseases; the house-fly and its malevolent ways; food and its relation to the spread of diseases; disinfection; unhygienic habits; practical sanitation; public sanitation; and an appeal for wise governmental interference and control in matters of the public health; all leaving little to be further desired.

The success that the "Primer" will certainly meet with lies in the very happy and effective way in which the author has succeeded in actually *talking* to his readers, so that it would seem that not even the most stupid of his audience could fail to grasp the significance of what is so interestingly and truthfully portrayed everywhere throughout the book.

One feature of the book is the appending of simple resumes at the ends of the chapters, embodying the chief points sought to be driven home and remembered by the pupil. Another noteworthy feature appears in the chapters dealing with infectious processes, namely, in the repeated advice given to the pupil to seek the counsel and guidance of the intelligent physician.

The reviewer feels certain also that the book has a message for the teacher as well as for the pupil; for ignorance of the simple hygienic principles is often to be found ensconced on the rostrum as well as at the desk.

The advent of the "Primer" assuredly marks the beginning of a new era and now paves the way for the execution of the suggestions expressed by Dr. H. W. Hill* of the University of Minnesota, at the Baltimore Meeting of the Society of American Bacteriologists, that Bacteriology in the form of simple demonstrations be introduced in grade and grammar schools in the endeavor to make familiar some of the everyday important facts of bacteriology connected with the home life and human intercourse. Time could readily be found for this by deleting some of the hours given to the dull and deadening routine of the teaching of physiology. Such a change would make for a more intelligent and healthful class of citizens and a better citizenship—"*mens sana in corpore sano*"!

The book is well printed on good paper, attractively bound, and is remarkably free of typographical and other errors. There exists, however, one noticeable error in the brief biographical note appended to the engraving of the late Dr. Walter Reed, (Fig. 57); it is to be remarked that Dr. Reed neither allowed himself to be bitten by a yellow-fever mosquito, nor did he die from yellow-fever. The author evidently had in mind the case of Dr. Jesse W. Lazear who was associated with Dr. Reed in the investigation of yellow-fever.

NORMAN MacLEOD HARRIS.

[University of Chicago.]

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*Hill, H. W.: *Science*, 1909, xxx n. s., p. 625.

Girl and Woman. By CAROLINE W. LATIMER, A. M., M. D. *D. Appleton & Company, New York and London, 1910.*

The author of this work was formerly instructor in biology in The Woman's College of Baltimore. The sub-title is "A Book for Mothers and Daughters," but the reviewer believes that all medical students, as well as many practitioners and teachers, will find this book well worth owning. In its 318 clearly printed pages, and in the introduction by Dr. Kelly, of Johns Hopkins, we find presented in an interesting, intelligible way the gist of the physiological and psychological knowledge that some of us have tried to get from Dr. G. Stanley Hall's painfully monumental work on adolescence. From many scattered sources Dr. Latimer has amassed material that after her careful study and sifting gives us the main facts., as well as the most important views and ideas suggested by them. In a simple, compact form, easy of comprehension by almost any reader over thirteen years of age, we find a description of that most important period in life as regards the formation of habits and character, the years between childhood and maturity. Among the subjects considered are the physiology of girlhood during the transition to womanhood, some of the more important physical, mental and moral disturbances often met with during that wonderful period and some practical measures for their prevention and cure.

The nature of reproduction, in the lowest forms of life as well as in man, is well described, and in this part of the work the author's experience as a teacher of biology shows to advantage. Quoting directly from her: "For a girl to grow up uninformed of these facts and of the natural laws connected with them is doing her a great injustice, because she then enters life unprepared for some of its most serious problems and may have to pay heavily in health or happiness for her ignorance. The open, direct treatment of such subjects is a duty parents owe to their children." The perplexing question of menstruation is taken up in a most thorough manner. In the chapter on bodily functions, digestion, respiration, exercise and sleep, and also common errors in regard to them, are given the attention that their great importance deserve. There follow chapters on personal hygiene, including bathing, care of the skin, complexion, teeth, hair,

hands, feet, eyes and ears, daily life during school days, including influences of the home, of the school, of the social life of the school girl, of amusements, of relations with the other sex, and of reading; daily life after leaving school, divided into home life, college life, self support and dress. The final chapter takes up the commoner minor ailments of girls and young women, e. g., headache, indigestion, constipation, colds, over-fatigue, and points out the danger in certain alleged remedies.

The book is interesting and valuable and will go far toward meeting the needs of thousands of girls and women now seeking such information.

H. LINCOLN CHASE.

[Brookline, Mass.]

The Germicidal Effect of Water from Coal Mines and Tannery Wheeles upon Bacillus typhosus, Bacillus coli and Bacillus anthracis. Laboratories of Department of Health of Pennsylvania, Pennsylvania Health Bulletin, No. 5, Harrisburg, Pa., Nov. 2, 1909.

The laboratories of the Department of Health of Pennsylvania, recently made a study of the germicidal effect of water from Coal Mines and Tannery Wheels upon *B. typhosus*, *B. coli* and *B. anthracis.* This investigation was undertaken because of the fact that the water supplies of many of the largest cities of the state are located on streams which receive extensive drainage from coal mines, sewage from many scattered settlements and manufactural wastes, especially tannery sewage.

It has been noted that under ordinary conditions the waters of these polluted streams are remarkably free from bacteria except during floods when the large volume of fresh water is sufficient to overcome the acidity of these mine wastes and it is thus apparent that acid mine drainage and spent tan-liquors have the power to destroy sewage organisms in natural water courses. This power has been recognized by the State Department of Health of Pennsylvania, in its decrees relative to the disposal of sewage into streams which carry mine waste and tannery sewage.

The importance of this matter led to the above mentioned experiments to determine more definitely the actual effect of certain liquors upon certain micro-organisms.

Mine water from a coal mine and spent tannery liquor from a sole leather tannery were used for the tests. The mine water was typical of that which is constantly flowing to the lowest point in the mine and which must continuously be removed in order that the mining of coal may not be interrupted.

The spent tannery liquor results from the process of tanning hides with quebrach extract. The liquor used in these tests was obtained from the "color-wheel" whose purpose is explained as follows: After the fleshings have been removed and the hair loosened by lime and removed by a de-hairing machine, the hides are washed and then placed into a color-wheel or tank which contains a weak solution of tannic acid derived from the tanning liquors used in the regular tanning process. This color-wheel liquor contains the only tannic acid that is ordinarily wasted from extract sole leather tanneries. At this particular works operating two wheels, the total quantity of color-wheel liquor is about 12,000 gallons, daily. The total waste from this plant is in volume about 100,000 gallons, daily, and contains in addition to the above, waste from soap fats, wash wheels and vats, lime vats, acid vats, and the de-hairing machine.

In the laboratory the mine waste and the color-wheel-liquors were tested for germicidal action using *B. typhosus*, *B. coli* and *B. anthracis*. Various dilutions and periods of observation were studied. The general conclusions were as follows:

Mine water prevents the growth of the typhoid bacillus in one hour's contact. This waste markedly limits the growth of *B. coli* causing progressive death and preventing cultivation after 24 hours. Spent tan liquor limits the growth of the typhoid bacillus and causes its destruction after six hours. It does not destroy *B. coli* until after a 24-hour period of contact. *B. anthracis* is not eliminated by tan liquor, indicating that its spores are not especially effected by the tan liquor studied.

The broad conclusions from these studies are that it would be a mistake to exclude mine water and spent tan liquor from streams which may eventually become sources of drinking water, for it is apparent that neither typhoid nor coli and inferentially

the cholera organisms can survive the sulphuric acid present in acid mine drainage. The distance in which mine or tannery waste will be effective has not yet been definitely determined. Mine waste will evidently continue to be effective at a much greater distance than tannery waste. The latter should receive treatment sufficient to destroy anthrax spores before it is discharged into streams.

A. E. KIMBERLY.

[Columbus, Ohio.]

A Review of Twenty-one Years' Experience upon the Purification of Sewage at the Lawrence Experiment Station. H. W. Clark and Stephen d'M. Gage. Report Mass. State Board of Health, 1908.

An abstract and condensed review of twenty-one years work on the part of a large crop of assiduous workers must necessarily be incomplete, for the authors have packed into 288 pages the summaries of the annual reports of the State Board of Health since 1890.

The Lawrence Experiment Station was established in 1887 and has been operated ever since with constantly widening scope. The first report was made in 1890 by Hiram A. Mills, C. E., and contains results of experiments with the intermittant filtration of sewage through sand, gravel, and other soils at varying rates and under different conditions of application. These experiments first established the now well known facts of the intermittant process, chief of which are the part which nitrification plays therein and the fact that this action is affected by the exposing of the sewage in a thin film to the action of air and bacteria. The 19 filters which were operated up to the end of 1890 furnished much data regarding the mechanical and physical properties of materials employed in filtration, the storage of nitrogen in the filters, the period of flow of sewage through filters 5 feet in depth, nitrification and the nitrifying organisms, methods of analysis and investigation, the chemical precipitation of sewage, etc.

The report for 1891 contained data regarding the permanency of filters and the effect of the organic composition of the materials used in the filters upon the quantitative and qualitative efficiency

of the filters. It is interesting to note the operation of a gravel filter during this year at the rate of 220,000 gallons per acre daily, the sewage being applied in 60 or 70 doses per day. This filter was very similar in principle to the so-called trickling or sprinkling filter, which has been developed in England during the last 15 years. Although this filter gave good nitrification results without artificial aeration, it was never recommended under Massachusetts conditions, which, generally speaking, favor intermittant filtration. It is impossible to describe in a few words the special studies into the details of intermittant filtration, which were made in the next few years. They included the studies into the different methods of operating filters, the physical properties of sands and gravels with special reference to their use in filtration, and also the composition of sewage and the changes which occur as it becomes stale. This latter work ante-dated the so-called septic tank, which took advantage, like its predecessor, the cesspool, of the fact that the storage of sewage decreases the organic nitrogen and increases the free ammonia in sewage stored therein.

In 1895 were made the first experiments upon the purification of manufacturing wastes. Filters which were artificially aerated were also tried and their capacity to produce stable effluents was noted. Under these conditions coarse filters were operated at rates of one million gallons per acre daily, and produced generally stable effluents containing high nitrates. Equally good results were obtained whether these filters were aerated slightly and artificially or not.

In 1897 extended experiments were begun on the purification of sewage by the so-called contact filters. In 1898 studies with the so-called septic tank were begun. In 1899 a trickling filter 10½ feet in depth and operating at a rate of two million gallons per acre daily was put into operation. In 1898 the studies were first made showing the advisability of disposing of the sludge from septic tanks by hydrolysis out of contact with the sewage as far as possible and that contact action in tanks of this character is a most favorable factor. In this connection experiments were made with tanks filled with large stones. In 1901 the stability of sewage effluents, especially from contact and trickling filters, was thoroughly investigated. Two slate filters were put into

use similar to those used in England by Dibdin. In 1903 special studies of the operation of the filters, especially during the winter, were made; also much chemical and bacteriological work in connection with the disposal of manufacturing wastes and bacteria of nitrification and reduction. These special studies have been continued to date and comprise a mass of special investigations into most of the details of sewage purification. From 19 filters in 1890 the number of filters studied increased steadily to 250 filters at the end of 1908. While some of the filters have been discontinued, most of the original 19 are still in very successful operation. In connection with these experiments about 50,000 chemical and 150,000 bacteriological analyses have been made. The sewage used was from the main sewer of the city of Lawrence and is distinctly domestic in character. The sewage on reaching the station has lost its dissolved oxygen and has undergone a slight decomposition or septic action, not so great, however, as to unfit it for experimentation in hydrolytic and other septic tanks. It is somewhat stronger than the sewages of other Massachusetts cities. It is about as strong as the average English sewage.

For details regarding the character of Lawrence sewage and the conditions under which intermittant filters and some other sewage purification devices operate successfully, the reader must be referred to the text of the review. There is the interesting conclusion that in all of the processes the chief dependance for purification must be upon putrification and nitrification, both of which are brought about by biological means. Of the devices employed, septic and hydrolytic tanks and contact filters are most favorable to putrifactive action, while trickling and intermittant filters are most favorable to the nitrification processes. Generally speaking nitrification processes bring about a more complete reduction in the amount of organic matter and the numbers of bacteria contained in domestic sewage.

This summary is to be followed next year by a similar one on the work at Lawrence with manufacturing wastes. The authors are to be congratulated for bringing within readable limits the important facts derived from these twenty-one years of fruitful effort.

ROBERT SPURR WESTON.

The Propaganda for Reform in Proprietary Medicines. Sixth edition. Containing the various exposés of nostrums and quackery which have appeared in The Journal of the American Medical Association. Price, paper, 10 cents; Cloth, 35 cents. Pp. 292. Illustrated.

This book presents in convenient form most of the exposures that have appeared in The Journal of the American Medical Association showing fraud either in the composition of various proprietary preparations or in the claims made for such preparations. Many preparations of the "patent medicine" type have been subjected to analysis and the results of such examinations appear in this volume.

ANNOUNCEMENTS AND NOTES.

IMPORTANT LEGISLATION AFFECTING EVERY READER. Owing to a recent strict interpretation of the postal regulations, this JOURNAL as well as the Journal of the American Medical Association, the Journal of the American Chemical Society and similar scientific publications are threatened with a loss of their second class ratings unless they discontinue carrying advertisements or unless the society or association grants members the choice of receiving or not receiving the Journal of the society; in the latter case, at a lowered membership fee.

Either of the above steps would mean a reduced revenue while to pay third class rates would greatly increase running expenses. In any case the added financial burden would have to be met by an increased subscription rate paid either directly, or indirectly through the association, by the reader.

Relief from the above conditions is offered by either of two bills now before Congress; House Bill No. 22239 (Mr. Dodds) or Senate Bill, No. 7521 (Mr. Owen), which allow to journals of scientific, benevolent or other societies the same right to advertisements enjoyed by the commercial press. We urge YOU to write AT ONCE to your Senator and Representative requesting them to use every proper means to further this legislation.

STANDARD METHODS OF WATER ANALYSIS. A recent bulletin of the U. S. Department of Agriculture, Bureau of Chemistry, conveys the information that the Association of Official Agricultural Chemists proposes to adopt certain methods there given as standard methods for the analysis of water. The methods as outlined are practically those to be found in Mason's "Analysis of Water" and differ in a number of essential points from the standard methods of water analysis of the Laboratory Section of the American Public Health Association. It would be unfortunate indeed to have two sets of standard methods for water analysis and it is to be hoped that the referee of the A. O. A. C. (W. W. Skinner of the Bureau of Chemistry) may see his way clear to confer with the Chairman of the Laboratory Section Committee, Prof. E. B. Phelps, of the Mass. Institute of Technology.

A NATIONAL DEPARTMENT OF HEALTH. The Committee of One Hundred of the Association for the Advancement of Science, has recently published a folder giving the following reasons

WHY THE PEOPLE OF THE UNITED STATES SHOULD HAVE A DEPARTMENT OF HEALTH.

1. To stop the spread of typhoid fever through drinking sewage-polluted water of interstate streams.

2. To enforce adequate quarantine regulations, so as to keep out of the country plague and other similar pestilences.

3. To supervise interstate common carriers, in so far as without such supervision they prove a menace to the health of the traveling public.

4. To have a central organization of such dignity and importance, that departments of health of states and cities will seek its co-operation and will pay heed to its advice.

5. To influence health authorities, state and municipal, to enact uniform legislation in relation to health matters.

6. To act as a clearing-house of state and local health regulations and to codify such regulations.

7. To draw up a model scheme of sanitary legislation for the assistance of state and municipal health officers.

8. To gather accurate data on all questions of sanitation throughout the United States.

9. To establish the chief causes of preventable disease and unnecessary ill-health.

10. To study conditions and causes of diseases recurring in different parts of the United States.

11. To correlate and assist investigations carried on in many separate and unrelated biological and pathological federal, state and private laboratories.

12. To consolidate and co-ordinate the many separate Government bureaus now engaged in independent health work.

13. To effect economies in the administration of these bureaus.

14. To publish and distribute throughout the country bulletins in relation to human health.

15. To apply our *existing* knowledge of hygiene to our living conditions.

16. To cut in two the present death-rate in the United States as the authorities are agreed might be done.

While we may not care to endorse in full the Owen Bill (Senate Bill No. 6049) the principle is undoubtedly correct and the question should receive the careful consideration of our readers. It is reported* that the opposition to the bill comes largely from a newly launched "National League for Medical Freedom," which is said to have among its directors the president of an Antivivisection Society, the president of the American Druggists Syndicate and some "mental healers." That the new society has ample funds is evidenced by the large advertisements appearing in the daily press which are so worded as to make it appear to the layman that the passage of the Owen Bill will in some way bring a man and his family under the domination of the "political doctors."

MEETING OF THE AMERICAN ASSOCIATION OF MEDICAL MILK COMMISSIONS. The Fourth Annual Meeting of The American Association of Medical Milk Commissions will be held at the St. James Hotel, St. Louis, Mo., on Monday, June 6, 1910. The three sessions will begin at 10 A. M., 2:30 and 8:30 P. M.

The program committee has not completed its work but reports that the following have agreed to be present and contribute to the program: Dr. M. P. Ravenel, of the Universtiy of Wisconsin; Prof. W. A. Stocking, Jr., of Cornell University; Commissioner R. A. Pearson, Albany, N. Y.; Assistant Surgeon-General Kerr, Washington; Dr. E. C. Schroeder, United States Department of Agriculture; Dr. Henry L. Coit, Newark, N. J.; Dr. Collins H. Johnston, Grand Rapids, Mich.

Among the subjects thus far assigned by the Program Committee are—"The Essentials Underlying the Production of Clean Milk," "The Bacterial Content of Milk from Cows Continuously Stabled," "The History, Development and Statistics of Milk Charities in the United States," "The Advantages, the Limitations and Some of the Results of Milk Charity Work," "The Production of Certified Milk."

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*Jour. A. M. A., May 28, pages 1792, 1793.

PRIZE ESSAY.—The International Dairy Federation offers a prize of 500 francs ($100) for the best work upon the Comparative Nutritive Value of Raw and Cooked Milk. The conditions under which the prize is offered are as follows:

Article 1. A prize of 500 francs is created for the purpose of rewarding the best work presented in response to a question of scientific or technological character proposed by the permanent Bureau of the International Dairy Federation.

Article 2. The conferring of the prize will be a function of each of the International Sessions of the Dairy Congress.

Article 3. Papers sent in reply to the question submitted should be printed or typewritten and may be drawn up in French, German or English. They should be forwarded in five-fold copy.

Article 4. An international jury composed of five members will be named by the permanent Bureau to judge the papers participating in the meetings.

Article 5. These papers should reach the Secretary General of the International Dairy Federation at least 3 months before the date fixed for the session of the International Dairy Congress.

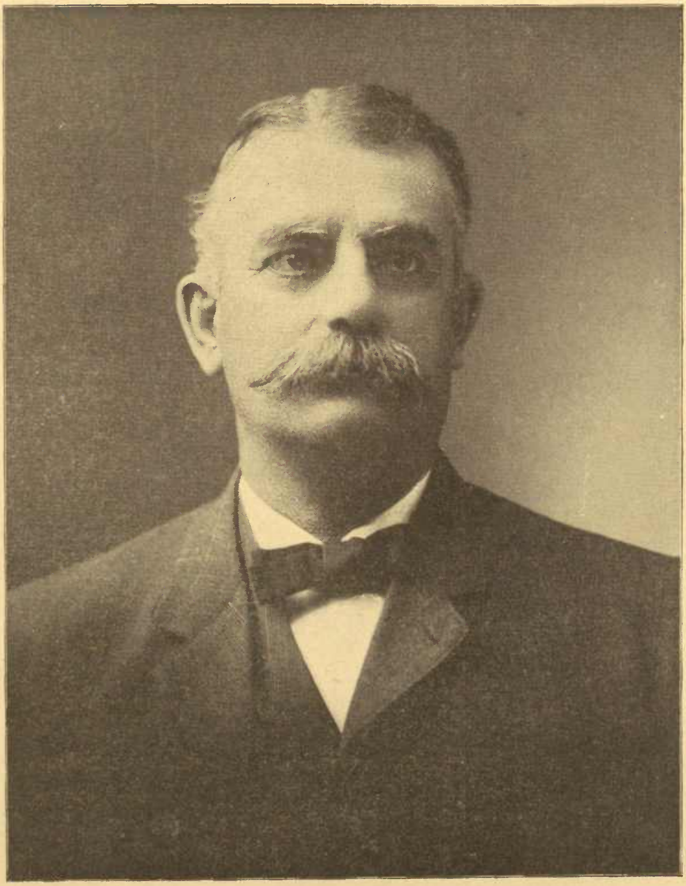
Article 6. In case any paper should be deemed unworthy of the prize, the corresponding amount may be carried over to the next meeting as a reward for a second paper if expedient.

The question submitted by the Congress is as follows:

"To determine by latest experiments, made at least in part on man himself, the comparative nutritive value of raw milk and cooked milk (pasteurized, sterilized, or dessiccated).

"In case of an advantage in favor of raw milk, to determine the role that the enzymes of the milk play in nutrition."

N. B. The papers prepared in response to this question should be forwarded to the Secretary General of the International Dairy Federation, 23 Rue David Desvachez, Brussels-Uccle, Belgium, not later than April 1st, 1911.



FRANKLIN C. ROBINSON,
President American Public Health Association, 1906.
Born April 24, 1852.
Died May 25, 1910.

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EDITORIALS

REPORTING OUTBREAKS OF ANIMAL DISEASES.

In most States the chief veterinary sanitarian has to depend upon an elective township official to report infectious diseases, but occasionally local practicing veterinarians do this if they have been called to diagnose the disease. Frequently, instead of calling for state aid, they prefer to guess at a diagnosis, thinking that otherwise their clients will consider them incompetent.

The elective township officials many times fail to report promptly through negligence, as very frequently they are poor business men. They frequently fear to report lest it may injure the possibilities of their re-election. However, the latter is only true of certain diseases, particularly hog cholera. They are usually willing to report an outbreak of glanders as they know that it can be transmitted to man. The principal reason why they fail to report hog cholera is because they think that their

constituents' premises will be quarantined. The word "quarantine" seems to send a thrill through the average layman. They had rather do anything than to have their animals quarantined. Furthermore, the average town chairman does not seem to consider it his duty to see that the state laws are enforced after the quarantine notices are posted. It frequently occurs that a man's hogs are quarantined and later his neighbors hogs become infected. The latter ships them to market and gets a good price for them while the man's hogs that are quarantined all die and the owner has to stand a heavy loss.

It seems a pity that an arrangement cannot be made so that some one lay official in each locality may be held responsible for such miscarriages of justice. Would it not be wiser to have a man appointed by the state department to report all outbreaks of infectious diseases to the chief state sanitarian, and also have him look after the quarantine work. In all probability, in most states, the chief veterinary official and the state commissioner of health could co-operate and thus utilize the same district quarantine officer. If such a system were created it would be of paramount importance to remove the appointment of these officers from the politicians and put them on a civil service basis with the power to remove them at any time for negligence of duty. If the rural health officials were appointed in such a way with the possibility of their being retained for several years it would probably be advisable to give them instructions by correspondence as to how they were to carry on their duty, and keep them familiar with new developments in all branches of the work. There are two reasons why it would be advisable to have one rural health officer in charge of human and animal health duties: 1st, because the remuneration would be greater and consequently better qualified men could be obtained; and 2nd, where such a disease as rabies exists which is of equal importance to the veterinary state official and to the health officer in charge of human diseases, a complete report on both aspects could be given to each department chief. Much could be done towards the eradication of rabies, which is now on the increase, if such a system could be adopted, because the health officer would not have to fear being defeated for

re-election if he performed his duties. The more conscientiously he performed his duties the more gratifying it would be to the state departments. Eventually, the laity would probably become educated up to the fact that it was for their own interest that enforcement of the law was required.

W. L. BEEBE.

Minn. State Live Stock Sanitary Board.

SAVING TIME IN WORK OF LOCAL BOARDS OF HEALTH.

One of the difficulties of health work in a small community is the determination of the specific work to be performed under a limited appropriation. Many health officers complain that they cannot obtain sufficient appropriations of money from their legislators and are hence handicapped in doing any work. The outcome is that little or nothing is accomplished. The reason for the inactivity is a lack of appreciation of the duties and opportunities of the office. The incumbent does not give sufficient study to his work. He does not realize how to produce the results which will be of the greatest good. He should do that work which will be not only of public benefit but of public instruction.

To dabble a little in several branches of work is not the best method to convince the general public that the health office can be and is a great good in the community. It is not as convincing to the legislature as a single line of work pushed to completion. Where but a very small financial appropriation is allowed the bulk of that money could well be used in a certain piece of work which would be of local importance. This sanitary work is developed as rapidly and completely as possible, with two objects in view. It is the purpose to develop a health effect which will be of great good and of permanence. Secondly, the work should be of such a nature and carried to such completion that the general public and legislative powers are convinced that good results have been obtained with their money, that the work has been necessary and the results are permanent, and further that with a greater grant this and more effective work could have been produced.

Some may pronounce this politics; but it is the only kind of politics which is legitimate in public health work. It is not only a work done for the community but an education of the public and of the legislature that the work was necessary. This education must be synchronous with and about the work. If the people's money is used to dig a ditch across a meadow it is not sufficient to state that it is a prophylaxis against malaria.

The ditch raises the realty value in that meadow, it drains dirty water, it eliminates odors and dampness, it checks the development of mosquitoes, it kills out insect pests, it makes the screening of houses less necessary, it makes the surrounding region more desirable for industry and for abode, it therefore increases the reputation and prosperity of the town. It is also a practical, permanent improvement, and will require little or no further outlay. When the public is told the above, with the necessary explanations, they will the better realize that the ditch was worth while and the health office has accomplished good. Little do they care if the malarial mortality has been reduced from six to one-tenth per one hundred thousand of their neighbors.

Since all sanitary work begins in education, that education to become effective should begin with those who may be of the greatest assistance—newspaper editors, lawmakers, business men and civic associations. The instructions should not be carried along one line to monotony, but a change of approach and a variety of subjects becomes more acceptable and more convincing. For instance, in discussing the cleaning of streets the subject of the influence of street dust upon tuberculosis become monstrously tiresome to the public. They would prefer to know what effect dirty streets have upon their comfort and household economy, upon their furniture and clothing, upon their milk and food supplies, upon their industries and business, upon the children and upon the reputation and prosperity of the town. If the appropriation will permit but an occasional sweeping of each street the whole town remains dusty and all suffer in unison. If with the same amount of money the principal street be kept scrupulously clean at all times and all dust eliminated, the people can see by contrast with other streets that the street cleaning department is effective where it is permitted to work.

If the money granted for a health office is but very little it seems unjust to the public for that money to be hoarded in a bank. Some remark that they have only a little money and that they will conserve it for awhile. Usury placed in efficient health measures causes a geometrical increase of the shekels, and then will the public invest more substance in their health

office, with resulting more benefit to themselves. But this investment will not come unless actual results are produced.

When publishing a report of the work of a small office it should be shown how much of the health officer's time was required to accomplish the work, and what so much time is worth to him or to any man. It should be shown that had there been appropriated more money more results in other lines could have been produced. With the resume should be indicated the future needs of the local community, in the order of their importance.

In proportioning the money outlay of a small health office there should be an allowance made for permanent necessities, as office rent, postage, stationery, transportation, salaries, etc. There should then be set aside a small fund to cover emergencies and to be used in the control of communicable diseases. It would then seem just to reserve much or all of the balance for developing one or more certain health measures which would be of the greatest benefit. These acts are of more or less local significance and must be determined for each individual community. They may be in reference to water, milk, foods, refuse, garbage, sewage, street cleaning, obnoxious plants or animals, various diseases, various industrial conditions or occupations, housing, school children or infants, hotels or asylums. Since statistics are the bookkeeping of successful health work provision should be made for the collection of vital statistics and the other necessary statistics which will show the value and results of the special work undertaken.

Probably the chief impediment of effective health work lies within the health officer. The health officer himself may be in as much fault as are his political backers. The dangers of the office are the political shackles; the hopes lie in the ability of the officer to force an escape by measures of judgment, of ability and sincerity. Just as long as the office is used for advertisement and for a living only, so far is the delivery of the one from the other. When the officer for his meagre pay merely gives the public an opportunity to read the title on his letter-heads, when he waits for an epidemic to gain a foothold before starting work the public cannot be expected to elevate his office or its pay. For a salary of a hundred dollars the health officer should

do a little over a hundred dollars' worth of work. He cannot be expected to devote all his time for such a salary, but he should earn what little he receives. The public is beginning to consider health work as a business proposition, and he who makes good and earns his salary is the first one to receive the raise. If a man cannot afford to devote the proportional time which the size of the salary indicates he cannot afford to hold the office. If he cannot afford to withdraw then he should not and cannot afford to draw the pay without work. Sincerity more than anything else stamps success. There are many health officers who do remarkably good work, but the few others who do not appreciate the importance and opportunity for good which accompany the office are the ones who check the elevation of the work.

Much time is lost in some cases due to the appointing power not being personally acquainted with the best man available for the position. It is a difficult matter to discover him and requires much search. While the search is going on it is often poor policy to allow the public to suffer and wait for action. This can easily be obviated by choosing an energetic, skilled man in the town or by accepting one recommended by state, college or other authorities. Such appointments could be made temporary or probational for a month or two, the man accepting such office under such provision. If he makes good, has the necessary training and ability and commands confidence the appointment should be made permanent.

In small scattered communities the ideal is not a health officer with a small salary in each town, making no provision for the intervening country, but a county health officer having jurisdiction over the entire county including all towns up to a certain limit of population. The officer should be selected by representative physicians, as the county medical society or by the state health authorities. Residence within the county or state should not be a necessary qualification to appointment. The tenure of office should be permanent, and the salary sufficient that all time may be devoted to the work and that the position will become so desirable that men will become especially trained for such duties.

HAROLD B. WOOD.

Philadelphia.

American Public Health Association

THE IMPROVEMENT OF PUBLIC HEALTH THROUGH TEACHING OF HYGIENE IN THE ELEMENTARY SCHOOLS.*

By ISABEL F. HYAMS,

Trustee, Boston Consumptives' Hospital.
Chairman of Committee on Hospital Outdoor School.

The Laboratory has been studying conditions and causes and now ways and means must be devised to apply this knowledge for the creation of right living conditions.

Perhaps all that can be done for the adult is to give him the means to knowledge—point the way how to use it, and let him accept it if he will, but for the children—parents and citizens of the future—there is a deeper responsibility. The State has taken it upon herself to educate these children.

It certainly seems reasonable that as much attention should be given to the building up of a healthy body as to the development of the mind, and during the early years of school life the growth of the child should be given the foremost consideration.

The body has withstood the ravages of civilization so wonderfully that not until aroused by the leaders in the campaign against tuberculosis or those investigating the health of the school children, do we realize the large number who are suffering from physical ills, due to lack of wholesome food, of fresh air, of proper clothing and shelter.

The children can rarely change their own environment. Many must live in the hurly-burly of the city and usually in overcrowded tenements, but in many ways they can control their personal habits towards a betterment in the daily living, if their lives are properly directed.

Efforts to teach the simple principles of hygiene have been—are—difficult, owing to lack of provision for such teaching

* Read before the American Public Health Association at Richmond, Va., October, 1909.

in the public school. The school house and school room should be examples of cleanness and afford every means to help the child to live under the conditions that make for right living.

"A most essential part of modern education is the early formation of such habits with regard to environment as shall conduce to the best living."

It seems almost useless to teach the lessons of hygiene and sanitation when the child has but to look about and see the laws violated, or to ask him to clean his hands if he is denied hot water. At least the school room dust could be cared for with the dustless duster, if a vacuum cleaner is out of the question. After a scientific lesson with Petri plates, the children will be interested to keep the room as free from dust as possible.

Whenever anything is "out of joint" we turn to the school to remedy it and it seems a greater burden than it can bear. But if the school has withdrawn the child from the active participation in the home duties, it can also be the means of restoring the child's interest and so in turn will lessen its own burden. The child, or the child and the family, is the centre of his little world—true it enlarges as he goes to kindergarten and school—but it is always in relation to his own unit, the family. The child is most closely concerned with the home. Treating the subject of hygiene through this interest, it can readily be made an integral factor in the following group of topics: The Care of the Home; The Furnishing of the Home; Food and Its Care and Preparation; Personal Hygiene; Hygiene of Clothing.

The essentials common to the above topics that make for the health and well-being of the child, are: Cleanness—Pure Air and Sunlight, Exercise and Rest, Beauty of Environment.

The child has little influence now, for he is being acted upon. The adult chooses the home, limited in choice by a meagre income and the type of building found in the large cities. But in the early period of life the child does not apprehend his environment. His imagination, stimulated and fostered in play seems to create experiences that are as delightful as they seem real. The doll of wood is hugged as closely as the most expensively dressed French doll, the gold house set with diamonds to be won in "London Bridge" is not far away, in imagination. Subways may be dug in sand, and temples erected with sticks and stones.

Can not educators striving to improve the health of the child, make use of this play and translate it into a directive force for the child's good through this means.

The scheme must be clear in the teacher's mind—she must study the child, and adapt the work to the child's growing need. And further, she must be so familiar with her scientific facts that their application is like art concealed. In the building of a house, for example, what are the essentials to be considered? Cleanness, pure-air and sunlight, properly regulated exercise demanding convenient arrangements, and beauty of decoration. Whatever material the child is to handle, whether it is the blocks of the kindergarten, or the paste-board, which is not permanent, or the wooden box used by the older child to be made into a doll house, the same principles must be carried out in the construction.

The first lesson in ventilation is that there must be an outlet for the foul air at the top of the room. This thought can be developed beginning with the child in the kindergarten in the construction of the house of blocks or the paper cutting; it can be shown in the representation of a room, pictured on paper, the fitting and furnishings cut from magazines and catalogues; it can be written about in the hygiene lessons, illustrated by cuttings and drawings; it can be considered in the plan for the wooden or cardboard house. If the lesson is kept alive in the child's mind and emphasized at the different stages of development and through different forms of work, when he has the chance to control the windows in his own home, they will be kept open.

Children at the Louisa Alcott Club, Boston, Mass., had been constructing a paste-board house, that is, a house made from a hat-box. The principle of ventilation had been discussed and the writer wished to illustrate it by means of the little house, but since it was so likely to take fire, a wooden box, representing a section of a room, was used.* This box measured 12 x 12 x 6 inches, and has six holes, one a little below the top, on each side, and the same near the bottom, and two in the top, all one inch and a half in diameter closed with corks to be taken out at will. First, the children breathed into tubes containing lime water (colored red with phenolphthalein) and the liquid lost its color. Then the car-

* See cut in "Air, Water and Food by Richards and Woodman."

bonic-acid gas from a burning candle was collected into a tube and when the water colored with phenolphthalein was poured in, IT turned white, and likewise when the children breathed into the tubes containing a solution of colored lime water, the color disappeared. And to more clearly show the result of the burning, sugar was burned and the carbon dioxide collected in a tube and subjected to the same test. The children could easily see that the gases were alike in this one respect. The pretty red chemical and the magic loss of color pleased them.

The candles were placed on a diagonal in the box and lighted, and the result was that the carbonic-acid gas rising with the heated air caused the upper candle to go out. Some of this air was drawn through the same red liquid. The children learned that the candles were giving off the same material as had been secured in the tubes and affected the candles at the top of the room. The children tested the air currents by means of joss-sticks, to see which way the wind blew. The upper holes, those in the roof, were opened and immediately all the candles brightened and the children saw that new, fresh air was coming to their aid as the warm air passed out and the carbon dioxide was going off.

Various other experiments were tried—supplying the air from above, below and with cross-currents; sometimes breathing into it and then drawing out the air and testing with the phenolphthalein (colored lime water), or again, drawing out the air in which the candles had been burning. It was unanimously decided always to have the windows open from the top and try not to sleep in a room where candles or lamps were burning.

This lesson need not take much extra time, for it may be made a lesson in hygiene, drawing, arithmetic, extending over several periods, and along with this work, the written work will be most effective. The lessons in English, so necessary to the children can be taught through the subjects close to their lives and if it tells of the great wonders of the universe, it must be uplifting. The compositions about household activities can be illustrated by cuttings from magazines and catalogues and even so ugly a subject as garbage has been made interesting. The bedroom, with its pretty furnishings, and the early morning light awakening the inmates, has made a very charming story.

This winter, the story about Tuberculosis was written, without any phthisiophobia, because it was based upon the laws of nature and sanitation. First through the talk about the plants and flowers, tracing cause and effect, they saw that all life comes under the same laws and that the laws of sanitation or hygiene, cleanness, pure air, sunlight, exercise, rest and beauty, could prevent as well as cure. The scientific presentation made it impersonal, though its application was concrete.

The public school curriculum is still so crowded in the desire to develop the child in every direction that it cannot lay sufficient stress on education for health and the majority of homes cannot, or do not, provide these elements of instruction which every child should receive. The result is that a large proportion of the children in the schools are physically unfit. For these children a new type of school is essential. The Open-Air School meets this need by giving careful attention to every detail of nutrition and sanitation. The child lives in the open air and is taught to know its value so that in time his system rebels in close quarters. He has simple, good, wholesome food and gradually desires that above all others. He learns to delight in a cold sponge bath that invigorates, and in warm water and soap that clean the hands and body. The daily routine in the school begins to effect his life, so that these lessons are carried into the home.

Sometimes the conditions are difficult to overcome; sometimes the family at home does not quite understand, and so as with the extension work, a "visitor-teacher" should be sent to help the home fulfill the instruction given the child at school.

The benefits of such a school are obvious and have already been adequately dealt with by medical officers connected with the open air schools in Germany and England.

If these are the means to lead the sick towards health, why should not the healthy be guarded against disease?

This survey emphasizes two important points: First, that in education health is fundamental and that the school should train the child in habits of health, and, second, to accomplish this end, conditions in the school room must be wholesome. The child should be given a comfortable chair and desk suited to his size.

The school room should be well lighted, the air in the room fresh, and free from germ-bearing dust. There should be time for play out doors and time and facilities for bathing.

It is possible for the teacher to co-relate the studies and to give instruction in practical hygiene, inculcating habits of cleanness and an enthusiasm for health which will give them the chance in after life—"the chance to be healthy, happy, efficient beings."

THE TEACHING OF HYGIENE AND SANITATION IN THE SCHOOLS.*

By JOHN W. RITCHIE,
William and Mary College, Williamsburg, Va.

Because hygiene is an old subject in the schools and sanitation is a new one, I shall make the teaching of sanitation the chief topic of discussion in this paper and refer only briefly in closing to the teaching of hygiene. And since everyone knows that it is possible to teach sanitation in high schools and colleges, and my experience will not allow me to speak of the results that may be secured below the fourth or fifth grades of a public school, I desire to limit my remarks in their application to those grades of the public schools that are between the fifth grade and the high school; the grades below the high school where the children are old enough to read for themselves.

Speaking within these limitations, I would say, first, that the teaching of sanitation in the schools has proved a great success. This I believe to be due to the fact that the great body of practical facts of bacteriology can be strung together on a theory so simple that it is intelligible to pupils who are far below high school age. I have seen considerable of the attempts that have been made to introduce manual training, nature study, and agriculture into the public school curriculum, and I am confident that neither teachers nor pupils respect as worth while any of these subjects as they respect sanitation, nor do they lay hold of them with the same ease and enthusiasm that they grasp the great facts in regard to preventable disease. Those who are in charge of our schools often complain that they are asked to include in the public school curriculum subjects that are not suited to children of a public school age. This objection cannot be made to sanitation, and, so far as the pedagogy of the question is concerned, every health officer may insist with a vigor proportional to his own estimate of the value of the subject, that it be given a place in the schools.

* Read before the American Public Health Association, at Richmond, Va., October, 1909.

As to the difficulties that a teacher of sanitation meets, they are identical with those that you meet when you attempt to educate the public, i. e., the teacher has the triple problem of getting his facts understood, believed, and acted on. There is a more or less prevalent idea that the pupils in the public schools will believe what they are told without having reasons given to them. This is a great mistake. "Men are only boys grown tall," says the poet, and for teaching purposes this is close enough to the mark, for entirely too much is said about the plasticity of the youthful mind and not enough account is taken of the tremendous amount of energy that we teachers expend in hammering and forcing these supposedly plastic minds into the molds that we have prepared for them. We *force* the pupils to examine evidence and to formulate and state the conclusions that can be drawn from this evidence, and when the pupil accepts as facts that which his own reason tells him to be true, it is credited to the open-mindedness of youth.

This leads me to the proposition that if sanitation is to be effectively taught in the public schools, it must be done systematically and logically, and the reasons for statements made must be given. Some good can be done, in fact MUCH good can be done, by teaching the facts as to a few specific diseases, but anyone who goes over the examination papers of the children who have had special lessons on consumption or typhoid fever without any training in what may be called the general phases of the subject, is as much impressed by the confusion and error in the minds of the pupils as by the amount of truth that they have learned. Pupils need to be taught about the microscopic plants and animals that grow in the body and cause disease. They need repeated illustrations of the smallness of germs, or they will never appreciate the possibility of infection by all the different paths by which infection is possible. They need to be taught about toxins and the neutralizing antotoxins of the body so that they will see for themselves the reasonableness of the antotoxin treatment, and they need to have proved to them by definite figures the value of such treatment. They need to be taught something of the defense of the body against germs in order that it may not seem a monstrous thing to put matter from a sore on a cow into the human body to ward off disease;

they ought to know that in nearly all diseases the body must cure itself if it is ever cured, in order that they may appreciate why it is that food and fresh air are more important than patent medicines in consumption, and that they may be made to understand that rational living protects against pneumonia and other similar diseases. Someone may object that this is teaching the theoretical instead of the practical side of the subject, but my whole experience has been that it is a perfectly simple matter to give this theoretical background to children, and I do insist that he who would shorten the circuit of sanitary teaching by omitting those general facts that make the subject as a whole seem sensible and reasonable, is in danger of breaking the circuit altogether. Moreover, I have sometimes wondered if the health officials who deliver the public addresses and write the bulletins for the education of the public could not with profit study our experience on this point. Everywhere I find intelligent, well-read people who believe in sanitation and its importance, but among these same people and even in the minds of some practicing physicians, the confusion of thought and the ignorance of even the simplest principles of bacteriology is distressing. They seem to have no idea of what kind of a creature a disease germ really is; of what it can reasonably be expected to do and not to do. They cannot even guess when they are safe from germs and when they are in danger from them; they burden themselves with useless sanitary precautions and too often omit the vital things that they should do; in short, they filter the water from the roof through charcoal, to take out typhoid germs, and pay no attention to the closet in the backyard. It has seemed to me that the time has come when those who are responsible for the sanitary education of the public can well afford to take a little time from the breaking of new ground and spend it in watering and in cultivating the sanitary crop that is already growing.

This brings me to the point where I am ready to tell you how in my judgment, you can aid the teaching of sanitation in the schools. In the first place, we still very greatly need your influence with school boards, to have the study of sanitation given a place on the program with a sufficient number of hours allotted to it to allow teachers to give their pupils a grounding in the subject that will enable these pupils to read your bulletins

with intelligence. No great amount of time is needed for this purpose, but the advocates of drawing, of manual training, of agriculture, of music, of business subjects, and of other special branches are clamoring at the schoolhouse door, and when we present ourselves we have difficulty in getting a hearing. There are some superintendents, and some members of schoolboards who still class us as faddists and they make out their curricula so as to devote the time to what they tell us are "more important subjects." We desire you to come with us to the schoolboards and tell them that, although we are cranks, yet we are sane cranks who revolve for the betterment of mankind, and not merely to give vent to our own enthusiasm. We want to form a mutual admiration society, and have you tell the older generation of Americans how sensible we are, while we tell the younger generation how sensible you are.

Another way that you can aid the cause of sanitary teaching is to use your efforts and your influence to see that the teacher and his pupils are provided with suitable printed matter for study. Teachers do not yet understand sanitation well enough to give it orally, and while talks on sanitation are attractive, it is hard to get progressive work done without a printed basis for this work. Send out all the school bulletins you can and send them for the pupils as well as the teacher if you can.

As to the results that follow the teaching of sanitation, I would say first of all, that it has a decided effect in educating the parents of the children. Sanitation is talked at home and books and bulletins are carried home and read, and many puzzling and seemingly contradictory experiences of the parents are explained by the knowledge of the children. In the second place, the pupil learns many things that will enable him to protect himself in a measure from disease germs, even if he is compelled to live in an unsanitary environment. In the third place, the public drinking cup and other unsanitary features of the school room disappear more quickly where sanitation is taught. In the fourth place, the pupils, having no financial or business interests to arouse their prejudices, can be taught more easily than adults to see the reasonableness of sanitation and to appreciate the work of health officials. And lastly, through a study of sanitation even more than through a study of government itself, pupils seem to

develop social consciousness and to grow into a realization of civic obligation. This is in a way an indirect result, but the health officer who has contended with the individual for the rights of the community as a whole, will not be inclined to underrate its importance.

In regard to the second part of my subject, the teaching of hygiene in the public schools, I will mention only two points. The first is that to teach hygiene effectively is far more difficult than to teach sanitation. The story of typhoid germs carried on the legs of a fly to food is a brief one and the importance of guarding against flies is easily taught. But the story of indigestion is a long and complicated one, and care and thought are necessary to conduct elementary classes through its meanderings. Numerous attempts have been made to teach hygiene without laying a physiological foundation, but the truth is that in actual practice this plan is not usually a success. For effective hygienic teaching implies that the pupils shall put into practice that which they learn, and hygienic rules taught without the reasons therefor lie on the surface of the pupil's mind to be disregarded and forgotten. All my own experience and all the experience of those whose work I have observed leads me to believe that in the average crowded class room the average untrained teacher cannot teach hygiene in any true sense without teaching enough anatomy and physiology to allow the pupil to get an idea of the general plan of the body and of the great laws according to which the body lives. This makes the distance to the hygienic goal greater than is the distance to the sanitary goal, and the teaching of hygiene is therefore more difficult and requires more time and more system than does the teaching of sanitation.

This brings me to the last point that I wish to mention, and that is why it is so difficult to secure time for the teaching of hygiene and sanitation in the public schools.

Twenty years ago or even fifteen years ago physiology was a standard subjects in the schools, but it has gradually been displaced by other subjects and fewer and fewer hours have been given to it.

In a few rural schools physiology still retains its old place in the curriculum and in some of the more progressive cities and states it has been, as it were, reintroduced; but in one state that

I visited the past summer I found in the capital city of the state, and it is no backward city either, not an hour devoted to the study of hygiene or sanitation from the first grade of the primary schools to the fourth year of the high school, and the time devoted to this subject in most schools is wholly inadequate. I have pondered long over why it is that superintendents and many teachers have thought that it is not worth while to retain hygiene in the curriculum, and I believe it is because they believe that the kind of hygiene that has been taught in the schools does not to any measurable extent help their pupils in living more healthful lives. Most of them form their ideas of the teaching of the subject from books published ten to twenty years ago, and when we examine one of these books it is amazing how little of real practical value is in them. The importance of fresh air is mentioned in these books, but all the convincingness that the antituberculosis work now gives the presentation of that topic is lacking. The care of the teeth is treated, but neither the writers nor the physicians of that day had the least idea of how important the teeth really are. Nothing is said of auto-toxication, of adenoid growths, or of other vital subjects, while whole pages are filled with discussions of bathing to keep the pores of the skin open, of the relative merits of cotton, woolen and silk clothing, of the comparative warmth of one heavy shirt and two light shirts, and of other points that the average citizen decides and will continue to decide according to his own common sense. I believe the study of hygiene lost its place in the schools because teachers believed it to be impracticable, and that if it can be reintroduced it will have not the slightest difficulty in holding its place against other subjects, as sanitation has no difficulty in holding *its* place, because everyone recognizes that there is much known in regard to personal hygiene today that is useful in preserving the health. And, as I have asked you to use your influence to have the study of sanitation placed in the school curriculum, so I would ask that you do what is in your power to see that the new hygienic ideas have a hearing in the public schools.

And now to recapitulate, we find that it is very easy to teach sanitation to public school pupils, provided it can be done systematically and the pupils can be given some grounding

in the general ideas of the subject. We find that where sanitation is presented to school children or to the general public in a fragmentary manner, a failure to appreciate the importance and significance of sanitary facts and a lack of intelligence in carrying out sanitary instruction follows. We think it would be wise for health officers to endeavor to instill into the public mind some general sanitary ideas, and we certainly think that in the public schools a general sanitary background should be sketched in. The greatest difficulties that sanitation teachers have met is the lack of any time at all to do the work in, and a lack of suitable printed matter for teachers and pupils, and we ask your aid in overcoming these difficulties. The results of the sanitary teaching as we have observed them are the general education of the parents and of the community, a knowledge of the methods of infection that enables pupils to avoid disease, better sanitation in the schoolroom, an appreciation and an understanding by the pupils of the work of health officials, and a growth in civic consciousness that we have never seen developed in any other way. The teaching of hygiene is more difficult than the teaching of sanitation because it seems to be successful only where founded on a reasonable knowledge of the structure and function of the body parts. The great difficulty in the way of hygienic teaching is that the subject has to a large extent lost its place in the school curriculum, probably because of the impracticable character of the subject as formerly taught

TEACHING OF HYGIENE IN NORMAL SCHOOLS. *

By Dr. ADRIAN DE GARAY,
Late Professor of Hygiene in the Normal Schools, Mexico City.

It is useless to speak to an association of learned hygienists, on the importance and utility of hygiene, as it is admitted as an axiomatic truth. If we want to find a demonstration of the correctness of this axiom, we need go no further than to make a study of the mortality statistics of those civilized nations which give practical effect to the teachings of hygiene. The most interesting points of this subject are taught and diffused amongst all classes, and in this the governments, the hygienists and persons of even moderate culture are perfectly agreed, that the general knowledge of hygiene is a logical consequence of the importance and utility of that science. The difficulty has always been and still is as to the manner and form in which such knowledge is propagated. Hygiene gives us a knowledge of the rules which have to be observed for preserving and perfecting our health; that is to say, its object is the prolongation of human life and the enjoyment of perfect health during life, together with sufficient physical and intellectual vigor to be able to enjoy that life and all the pleasures which it furnishes. We are therefore all interested in obtaining a knowledge of hygiene, because we first require to live and afterwards arrange our method of life. Without life there are no honors, no pleasures and no wealth. The most civilized nations are unquestionably those whose mortality is lowest and longevity highest. It is therefore necessary to give the best possible instruction on hygiene, to children, the working and professional classes, soldiers, prisoners, and in fact, to all the world. But it is above all things important to teach hygiene in the primary schools, as in this way we impart a knowledge of this important subject to the mass of the people, and especially as this instruction is given in a solid manner. If, therefore, the basis of instruction in hygiene as a matter of general education is found in the primary schools, it is unquestionable that the ones

* Read before the American Public Health Association at Richmond, Va., Oct., 1909.

charged with the giving of this instruction, are the professors who graduate from the normal schools. These professors ought to be fully instructed on all matters which relate to scientific hygiene, in order that, in their turn, they may be able to transmit that knowledge to the children, from this we come to the conclusion, that as the professors are those whose duty it is to teach hygiene in the primary schools, the classes on that subject in the normal schools, must have a special importance. If the school masters are not the ones to be charged with the instruction of the children in a matter of such importance as this, there is no one else to take their place and consequently, the pupils will not be sufficiently instructed on the subject, and especially, will not acquire the hygienic education which later on would render them such immense services throughout their lives.

It is a serious error to believe that the instruction in the normal schools need not go beyond School Hygiene, as this subject may be considered a special one in the branch of general hygiene, similar to Rural, Hospital, Military, and other subdivisions of the subject. In order to be able to thoroughly understand and appreciate it, it is necessary to begin by obtaining an ample knowledge of general rules of hygiene. School hygiene is a subject of special interest to the master, both as regards himself and as regards the individual school under his charge; but it is not school hygiene that he is going to teach his pupils, and consequently, if he knows nothing more than that, he cannot give them any really solid instruction on hygiene.

We consider that one of the most important duties of the public authorities is to endeavor to make men strong and healthy and to live the greatest possible number of years. This is not only humanitarian but tends to the felicity and wealth of each nation, as the richest and most powerful people are those who have the largest number of inhabitants in a perfect state of health, as under these conditions, man is the greatest source of wealth, whilst if weak and sickly, he becomes a charge on the community and impoverishes it. Moreover, as I have already said, there can be no happiness without health, and it is the duty of governments to make all their citizens healthy and therefore happy.

We therefore recognize that in the normal schools there must be two courses of hygiene: One treating of General Hygiene and the other of School Hygiene, and we also consider it indispensable to have these courses taught with the necessary thoroughness, so that the professor will leave the school with a real knowledge of the subject. For that reason the normal school pupil must study hygiene from a scientific point of view, and not be satisfied with the study of superficial papers which can furnish him an empiric and superficial knowledge. The normal school professor must acquire a great deal of thorough knowledge to be able to give his pupils proper instruction in accordance with their ages. When one has learned little, the extract of that little really is nothing, as it has all evaporated.

We are of opinion that, in hygiene as in other matters of study, the instruction should be as practical as possible, and should assume an agreeable form. Practical knowledge of this subject brings into play many of our senses, obliges us to fix our attention and thus easily preserve what we have learned in our memory, besides which, the instruction by this method is greatly facilitated. On the other hand, the teaching should always be given in such a way as to be pleasant to the pupils, because it is very evident that the pupil who gets tired of the subject cannot learn. If the normal school pupil is taught in this manner, he will try to teach his pupils in the same way.

Practical instruction in hygiene is given in three ways: By means of a chemical and bacteriological laboratory, the object of which is to analyze many substances, such as air, water, soil and food in general; secondly, by means of excursions in which the pupils can see and study the hygienic conditions of public institutions and establishments, such as theatres, churches, schools, factories, water supply works, drains and sewers, bakeries, public light works, etc.; thirdly, by means of hygienic museums in which objective lessons can be given on subjects that are essentially connected with hygiene.

The analytic and bacteriological instruction, specially relates to the medical profession, who will later on be charged with the solution of the problems connected with this branch of hygiene, and for which a very high degree of scientific knowledge is required. At the same time, simple analysis and microscopic

examinations can be made in the normal schools, in matters connected with air, water, wine, milk and certain articles of food such as meat and bread. The school excursions are of great utility, as they not only serve for recreation and instruction, but almost always, as hygienic trips as well. Hygienic museums can, up to a certain point, take the place of the fundamental purposes of the laboratories I have mentioned and even of the excursions.

With the help of luminous projections (cinematograph or lantern slides) a knowledge can be given of the pathogenic micro-organisms and those which may normally be found in normal articles of food or such as are damaged. The magic lantern can also furnish brief lessons on the chemical reactions that are desired in food and show us what those foods are before and after the reaction, or in their respective colors.

For instance, we can show how a bottle of milk which is presented already adulterated with starch, is treated with a few drops of tincture of iodine, and in such case the milk assumes a violet color which is shown in the projection. This lesson will remain permanently engraved in the minds of the normal school pupil, so that they will never require to go to a laboratory to ascertain that point. As regards school excursions, they can be substituted, whenever it is not possible to take them with the necessary frequency, by moving pictures. We can perfectly bring before the eyes of the spectators, the appearance of public establishments in different nations, at the same time giving some explanatory observations of the views, by word of mouth. In this way, the pupils can see many such establishments and make comparisons in a way they could not do by simple excursions. In this way, they will be able to see in actual life and movement, a factory, a school, a bakery, all in full work, as well as observe the processes used in making wine and beer, the great works at Gennevilliers and Acher for purifying the water of the Seine, etc., and many other useful lessons of this kind.

It is not our purpose to enter into the details of the organization of the hygienic museum, the chemical and bacteriological laboratories, the programmes for the school excursions, as all which we have desired is to point out in a general manner, that the study of hygiene in normal schools ought to be scientific,

well grounded and practical, without entering into minor details of organization and classification, which can easily be attended to later on in view of the general programme of the class.

What we consider desirable to point out, is that the study of hygiene in the normal schools should be made in the last years and in two courses; first, that which relates to general hygiene, and second, that which refers to school hygiene. This plan has the advantage that the pupils come prepared and already have a sufficient knowledge of Geography, Astronomy, Physics, Chemistry, Natural History, etc., and with all these previous studies they can undertake that of hygiene in a thorough and scientific manner, and that it will also serve to bring to their minds the principal points of the subjects they have already studied.

As a summary of our work, we present the following conclusions:

I. Hygiene ought to be one of the principal subjects taught in normal schools.

II. Hygiene ought to be taught in two courses, of which the first would be with general hygiene and the second with school hygiene. Both courses should be given in a scientific and thorough manner under a sufficiently complete programme.

III. The study of hygiene should be undertaken during the last years of the courses for the professorship.

IV. The instruction should be given in an entirely practical and agreeable manner.

V. In order that the instruction may be practical, chemical and bacteriological laboratories should be established in the normal schools besides hygienic museums and halls to present moving pictures and magic lantern views, whilst school excursions and hygienic trips should be organized under a well meditated plan.

ORGANIZATION OF THE PUBLIC SCHOOL HYGIENE SERVICE IN THE FEDERAL DISTRICT OF MEXICO.*

By Dr. ALFONSO PRUNEDA,
Mexico City, Mexico.

Ever since Mexico started on the present era of progress, the Federal authorities have striven to improve the hygienic conditions of the schools and their attendants. Various provisions had been dictated to this end, but it was not until July, 1908, that the Public School Hygiene Service of the Federal District was definitely established. In formulating the regulations the studies made in the United States and Europe by special commissioners of the Mexican Government were borne in mind.

The Public School Hygiene Service of the Federal District has special charge of the primary schools, but the secondary schools are also the object of frequent medical inspections, which endeavor to maintain the hygiene of the school buildings as well as that of the scholars in the very best condition, toward the realization of which the physical education, compulsory in every public school, in no slight measure contributes.

The present paper proposes to present briefly the actual condition of the Public School Hygiene Service in the Federal District of Mexico.

The medical inspection of the primary schools in the Federal District is in charge of a technical corps formed by the chief medical officer of the Public School Hygiene Service, ten medical inspectors and two assistants, also medical. It depends directly on the Department of Public Instruction and Fine Arts, which has charge of the progress of education in the Federal District and Territories and is ever striving to better conditions. The teacher and architects also assist in this medical inspection, as will be later described.

The objects of this medical inspection in the primary schools are threefold: 1st. To see that the school buildings and furni-

* Read before the American Public Health Association at Richmond, Va., October, 1909.

ture answer the requisites of hygiene. 2nd. To prevent the propagation of transmissible diseases within these schools; and 3rd. To watch for the preservation of the pupils' health, maintaining a proper balance between the physical and the intellectual education. Furthermore, the medical inspection, as a complementary administrative function, has to examine any teachers applying for leave of absence on account of ill health.

All school buildings are made the object of a special visit twice a year, in order that the medical inspector may acquaint himself with the hygienic conditions with regard to light, ventilation, capacity of building with reference to number of pupils, condition of furniture and school material, state of the gymnasiums and other school buildings, cleanliness of same and purity of drinking water used, toilet rooms, etc., etc. All these data are entered on special reports, which likewise contain such improvements as may have been made from one visit to another.

In addition to these visits, the medical inspectors, accompanied by the architect inspectors, examine the buildings used for schools and report whether they fulfill the necessary hygienic conditions or if some adaptations must be made prior to admitting the children: these reports are borne in mind before approving any building for school purposes.

Not all the buildings used in the Federal District have been constructed expressly for schools, although the Department of Public Instruction is ever striving to attain this. In the last ten years, however, the movement in this direction has greatly increased, so that, while in 1896 there were only two school buildings *ad hoc*, there are now 37 completed and 3 in construction. Special efforts are made, as has been stated above, toward endeavoring that, even though the buildings be not expressly built for schools, they should, nevertheless, fulfill the best possible hygienic conditions.

The prophylaxis of transmissible diseases is obtained in the schools by various means. In the first place, the medical inspectors in normal times make two visits a month, which are intended for the examination of the children from the point of view of such diseases; in times of epidemic these visits are made daily. Besides, as is done in the New York schools, the principals receive daily reports of cases of contagious diseases which

may have occurred on the previous day, stating the houses where these cases have been observed; these reports are delivered daily to the Public School Hygiene Service by the Board of Health. Lastly the principals themselves, who possess certain rudiments of knowledge of the chief symptoms of the most common transmissible diseases, are compelled to immediately advise the respective medical inspector of any cases of these diseases which occur among the children in their schools. As soon as the existence of these kind of cases is proved (measles, scarlet fever, smallpox, varioloid, whooping cough, typhus, typhoid fever, erysipelas, diphtheria, mumps, tuberculosis, syphilis, acute conjunctivitis, trachoma, skin diseases, favus, itch) the children are at once removed from school and are sent home with a note to their parents, and are immediately isolated and may not return to school until they present a medical certificate to the effect that there is no longer any danger of contagion; this certificate, when deemed necessary, is subjected to the approval of the corresponding medical inspector.

Inasmuch as in this same school there may be enrolled brothers of the sick child, the medical inspectors, in order to make sure of the prophylaxis, are authorized to remove these children even though they may not be sick. In the same way, when any case of a transmissible disease exists in the family of any pupil, the latter is denied entrance to the school until all danger of contagion has passed.

Now, as not only the children, but also the teachers, may transmit these diseases, similar rules are applied to the latter. And lastly, if the tenth part of the pupils of any school are attacked by a transmissible disease, the school is closed, if in the opinion of the chief of the Public School Hygiene Service this is deemed wise.

As a special measure we must mention the duty of the medical inspectors to vaccinate, and revaccinate when necessary, both pupils and teachers.

Now, as the chief aim of education is the harmonious development of the child, it is beyond doubt that any Hygiene Service which endeavors to fulfill its requirements, must bear specially in mind the pupil's state of health when entering the school and the changes undergone therein. Following this precept the

individual examination of pupils in Mexico is held when they first enter the establishment, and later once a year. These examinations are made in part by the respective medical inspectors and in part by the teachers; are held in the same school building, and, whenever possible, in the presence of the parents who are expressly summoned for the purpose by means of a special printed notice, and with the corresponding teacher.

The data from this examination (vaccination, health antecedents, general state of child, condition of (specially) the head, skin, mouth, nose, throat, speech, vertebral column, and extremities, chief inner organs and the nervous system) are entered by the medical inspector on a certificate known as "principal"; while on another certificate known as "complementary" are entered the observations taken by the teacher (visual acuteness, auditory acuteness, both extremities but only in so far as these reveal any abnormality, stature in centimeters and weight in kilograms). These examinations are briefer in the rural schools, and both here as well as in the city schools call forth observations and indications made by the medical inspector to the teachers for the care of each child, which remarks are entered on the certificates and in a special book consulted by the teachers. Furthermore, should the children need to remain under the doctor's care, this fact is entered on the respective certificate with the words "under medical observation," and the doctor, whenever he visits the school, pays special attention to these children.

In every large group of children there are bound to be some whose health conditions are not satisfactory; of these, some may be allowed to continue attending school, although subject to special regulation; whilst others, unfortunately, must be isolated in special establishments where they may continue their education, or even sometimes have to forego this completely. Thus, pupils having certain visual defects which may be corrected or such as suffer from the hearing, receive special instructions which are also communicated to the teachers so that they may endeavor to remedy the ill.

In the Federal District no dispensaries, where school children may readily receive the needed medical assistance, as yet exist; but a plan for the establishment of these most useful institutions

has already been formed, while the National Dental School, for the training of dentists, provides free attendance to children suffering from the mouth and specially the teeth. But when the medical examination proves that any child is not normal, the parents are urged to better his situation, and in the certificates given to them the free consulting rooms where their children may receive medical attendance are mentioned. It is opportune in this connection to mention that the opticians of the City of Mexico philanthropically make discounts from the price of all glasses ordered by the doctors for the pupils.

The Department of Public Instruction and Fine Arts is about to establish a special school for children suffering from skin diseases, where all those afflicted with favus are isolated, while those attacked with itch and warts receive medical attendance, and at the same time enjoy the benefits of a regular education.

While not in the very near, but still not very distant future, it is the purpose of the authorities to establish school colonies for such children as need a change of mode of living in order to attain a more perfect development, as well as special buildings for intellectually abnormal or backward children.

As an annex to the Public School Hygiene Service there is established in the City of Mexico that of pedagogic anthropometry which, in part, follows the ideas of those established in certain cities of the United States.

This anthropometric service is also intended to ascertain the physiological averages of the children, and it is certain that in a future not very remote a sufficient number of observations will have been made to give anatomic and functional averages of the Mexican children at the different school ages. This, as will be readily understood, will be of inestimable worth in cooperating in the aims of the hygiene service.

The Federal Government spends slightly over ten thousand dollars Mexican currency on the Public School Hygiene Service, including salaries to the medical inspectors and their assistants and other salaries of the same service.

To this amount must be added the sum of $40,000 spent by the Primary Education Department yearly for cleaning and sanitation of the schools. A few million pesos have already been spent on the construction of school buildings perfectly

adapted to their needs, and Congress has just decreed three millions for new school buildings. Besides these amounts for bettering the conditions of the Primary school pupils, must be added the sum of ten thousand pesos, being the salaries of other medical inspectors having the secondary schools under their charge. Among these medical inspectors must be included the recently created post of inspector general of physical education, who, as his name implies, see that the said physical education is imparted in the schools in the best possible way.

Although this service has been installed only one year in the Federal District, and like every new labor has encountered difficulties in its working, yet the results obtained have been quite considerable, since although there is still much to do and remedy, the hygienic conditions of a large number of buildings used as schools have been greatly improved; an effort has been made to maintain and preserve the pupils' health, and, most of all, a general report of the pupils' state has been made with a view to bettering their conditions.

DISCUSSION.

Dr. C. T. GRAHAM ROGERS. In these papers I have noticed from the elementary school even to the medical school, that in the teaching of hygiene there is one point that is lost sight of. In the paper read by the gentleman from Mexico only, is mention made of the fact at all, and that is the question of industrial hygiene. The majority of the students go from the school to work, and spend probably one-third of their day in the factory. A great many of the High School pupils will go into the factories or industrial establishments and spend probably half a day or more than half a day, and the graduates of the Medical School depend largely on the workers for their patients, while we have done nothing regarding the teaching of industrial hygiene. If they could teach the pupils in the schools some of these things, such as removing dust, taking care of themselves around machinery and having proper ventilation we would have less difficulty in installing exhaust plants, because the workers themselves do not insist upon it being done. I think from the elementary line school to the high school, and from the high school to the medical school industrial hygiene should play as important a part as domestic hygiene.

Dr. KNOPF. I think a few more words might be said on the subject of school hygiene. The distinguished Professor told us about the burden which we impose on the teacher by asking her to work four or five hours in succession. This is true, but if we would make an effort to have all lessons taught in well-ventilated and well-lighted school rooms, and weather permitting, as many lessons as possible outdoors, with regular recesses, and never have classes of more than 30 to 40 pupils, I am quite sure that it would not be as hard on her nor on the children. We do not pay enough attention to good ventilation, to outdoor teaching when it is feasible, and to the limitation of pupils per class. I have talked with teachers about this and I know they are not responsible, but I think the Board of Education and the superintendent should look after this matter. When teacher or child works four or five hours a day it is about enough, even if outdoors

or in well-ventilated rooms. How much worse is it when the rooms are badly ventilated or overcrowded! The children in the lower grades should have no home lessons. If they have to work at home, they often do not get enough play, rest or sleep.

There is one more thing for which neither the superintendent nor the teacher is responsible and of which we haven't heard a word throughout this session, and that is child labor, not in the factory but at home. There is just as much cruelty in child labor at home as child labor in the factory. Asking a child of ten years, after it has gone to school five or six hours, to take care of the little one for another four or five hours or help in the kitchen or do errands is child labor at home. Is it a wonder when such a child proves a lazy and stupid scholar? Before condemning a child for indolence or stupidity, let us find out if it is not a case of overwork.

Another thing I have never heard spoken of in any section of hygiene considering school children, is forcing the little ones to carry veritable loads of books to and from school. I have seen children in New York that carry a bundle of books weighing three, four or five pounds up five flights of stairs. Is there really need of this? If there is and there are not a double set of books, let us buy them, but do not cause our little ones to have spinal curvatures from carrying loads of books. I am sure there is no school-board which would not gladly increase the appropriation for two sets of books to avoid such possible injury to the pupils for whose physical well-being they are as much responsible as for their mental and intellectual development.

Dr. HURTY. I think that Prof. Ritchie opened up a very rich field when he spoke of the teacher and the unhygienic surroundings which affect her. We have been looking into the statistics regarding the teacher in Indiana and we find that while one in every eight of our deaths occur from consumption in general life, among the teachers one out of every 5.3 die of consumption. We find that the sick rate is higher among teachers, the duration of life is shorter, and the death rate is higher than in general life. Why is this? The teacher—I have in mind the woman teacher—has about the same home surroundings as the wife and mother, but she has different surroundings in the

school, and it is the school that kills her. It is the school that raises her death rate, and the percentage of consumption, and you can imagine what a commercial effect it has inasmuch as her efficiency is all the time decreasing. One of the greatest sins in this world is the sin of the unhygienic school house. We must get over that sin. It is an egregrious sin and we are paying an enormous price annually for it, more than enough, I am sure, than to keep our Navy going. It is startling to think that our teachers whom we expect to teach hygiene are suffering more than the average of all classes in our state. We have been presenting this fact to teachers' institutes. We have published it in various ways, and the result is that the subject will be taken up at our next annual State Teachers' Institute. We believe that the discovery of this fact will be the entering wedge by which better sanitary school conditions will be brought about. Where can we do better work? Dr. Ritchie said we may pass laws to protect the working man, but we do not protect the helpless little children in the schools. Think of that, it is a ridiculous situation. We have schools where children are being destroyed where their spines are being bent by being forced into seats that do not fit them, and where the first requisite of life, an abundance of fresh air is denied them.

Dr. GARDNER T. SWARTS, Providence, R. I. The preparation of this symposium by Dr. Pease, as a member of the programme committee, I think has been fully justified by the papers which have shown us the conditions that do not exist in the study of hygiene. We as sanitarians are endeavoring to have the public live in certain ways for their own benefit, and yet we have no means of teaching them except in a meager way, as is shown by those who have presented papers, and those who have discussed the subject. There is a great vacuum of knowledge right where we ought to begin, namely, in the kindergarten. Children should begin to learn what hygiene is when they begin at school, and by the time they become teachers they will perhaps know what they are talking about. The great difficulty seems to be to know how to approach the ones we wish to teach. How can we teach the medical student? Can we give one or two lectures and expect him to intelligently carry out the work as a

physician, and as a co-laborer in the life of the people when he assumes that a garbage heap produces disease, and when he believes that sewer gas produces scarlet fever and diphtheria? When a physician is not able to diagnose a case of scarlet fever or measles because the medical schools have failed to teach him, how can we health officers expect him to exercise his duties, and report his cases? As I stated in my address the other night many schools in the United States do not give their students an opportunity to examine patients who have these diseases. How are we to expect physicians to live up to the law which we as Health Officers demand? This Association can assist by reaching out and co-operating with all those who have control of education, both of the lower classes and in the medical schools by showing the advantage of teaching practical sanitation.

Dr. RITCHIE, in closing the discussion said: I have just one thing on my mind, and that is about the working hours for teachers. I do not believe that the average woman teacher can work under the present average conditions five or six hours a day without breaking down. The hours of labor are too long. I am on the Board of Trustees of a girls' school, and when I ask the teachers about the work, they invariably tell me the work is very heavy. They are teaching about four or five hours a day. The president of the school said that he wouldn't give a cent for a teacher, who couldn't teach 25 hours a week; he said that that is only ordinary work. Naturally we have broken down in that school one teacher. Another one has had nervous prostration. I think that there ought to be some way of shortening the hours for the teachers. If the pupils should stay longer, we should have a double shift of teachers.

Dr. WESBROOK, in closing the discussion, said: I think the Association is to be congratulated that we have evidence here this evening of the approach of an educational movement beginning in every possible direction. We are talking about teaching the older people. Perhaps you do not know that in the United States there are 161 medical schools, and in all the rest of the world only 174. That is why those ten sub-committees were appointed. We succeeded in getting an average of 30 hours raised to 130 for instruction in hygiene.

Prof. Ritchie has brought us a lot of new material to-night. He has provided a God-send so far as the teaching of the students is concerned, in certain books which he has prepared, and they are not so technical but what everybody can understand them. The truth can be told in un-technical terms, and that is very important. I think we are to be congratulated that men will take the trouble that Prof. Ritchie has taken.

INSTRUCTIVE INSPECTION.*

By ELLEN H. RICHARDS,
Boston, Mass.

The checking of wastes of all description is much in the air but there is less discussion about WASTE OF EFFORT than might be expected. Yet effort means time and saving of time saves lives as well as money.

Nearly every investigation of sanitary evils leads back to the family home (or the lack of one) and a great deal of the health authorities' work is saving at the spigot while there is a hundred times the waste at the bunghole. The medical inspection of the schools was found to have little effect without the visiting school nurse, for the parents did not know how to better conditions and in the majority of cases did not believe in the need.

Such experience should give the health authorities a cue. Rules and Regulations should be enforced, but enforced with instruction as to the means of doing it. The WHY is not so easily understood as the student of sanitary science seems to think. Germs and microbes are empty air to the street urchins until they have been shown on a screen in a lecture hall or until cultures have been made in the sight of the children in a school room. One whole school district of intelligent parents was converted, many years ago, by giving the children in one class two Petri dishes each with sterile prepared gelatine, with directions to open one in the sitting room while it was being swept and two hours after the room had been thoroughly dusted to open the other in the same place for the same time. These "dust gardens" as the children called them "took the place of the family album" for callers, and spread knowledge.

Hundreds of similar experiences should convince any intelligent earnest Board of Health that a teacher by nature or training should be in their employ to be sent WITH POWER like any other inspector, wherever ignorance—usually diagnosed as stubbornness—is found.

* Read before the American Public Health Association at Richmond, Va., October, 1909.

The health officer whose mother was a good housekeeper, not afraid of work, has no idea of the attitude of half the housewives of his district. Having been made as a boy "to get the dustpan and brush and sweep up his whittlings," he does not realize that these houses in the tenement district have no dust pans and that no one would bend his back to sweep up litter if there were. It is all swept into the alley or the street. Cheap, long-handled dustpans would be valuable sanitary implements. As has been elsewhere suggested, the garbage question in the tenement house needs study and must be solved by a practical housewife. There are such, and Boards of Health are wasting effort and the town's money until they avail themselves of this help in the enforcement of their rules.

All Health Boards use the strong arm of the law, i. e., a police inspector's club to drive the ignorant and careless householder to keep his premises from becoming a nuisance. The newly-arrived, prospective citizen, or more often, citizeness, fails to understand what it is all about—neither the words nor the pantomine convey an idea, except that this country is topsy-turvy anyway, for everything is different in this new land.

In the process of learning what not to do, the dwellers in the alleys flee when the Health Officer appears and oppose a stubborn indifference to his threats. When his back is turned, matters go on as before and nothing is gained, but an opportunity is lost.

Law is a potent educator when rightly applied, but it may work more harm than good.

Rules of action clearly explained are soon accepted—like traffic rules, notification of contagious diseases, disinfection, etc.

The placing on the force of each town of at least one specially trained "Explainer" would result in cleaner backyards and less illness and, better than all else, a more friendly feeling between the officials and those they honestly wish to help; for I do not think there is often justification for such remarks as were made to me by a shrewd California country man when I was showing him about in the traveling exhibit, the sanitation car—"Oh, this is all to get a job. It's another form of graft—to get some money to spend."

It is true that the value of many health measures does not appear on the surface. Some times it is necessary to wait for vital statistics to prove a gain.

It is beginning to be thrown in the faces of sanitary authorities that the Laboratory wisdom does not reach the street; that there is not enough, or rapid enough, improvement in general conditions. Newspapers are ready, for the most part, to disseminate information and benevolent societies write tracts, but we must remember how little WORDS mean—especially printed words—to those unaccustomed to acquiring information that way.

The actual showing in an alley of the process of cleaning up; the going into a house and opening the windows at the top and tacking on a wire netting to keep out the flies; the actual cleaning of the garbage pail, perhaps, or at least the standing by and seeing that it is properly done—all such actual doing, even if it is done only in one house on a street, will spread the information all over the neighborhood.

One of the most helpful offices is to tell the woman where she can get the special article needed, and what it will cost, and to show her the thing itself, in a friendly spirit. Such visits would soon revolutionize the sanitary condition of any community.

Villages need this help even more than cities, for there they have fewer chances to know about inventions and, perhaps, are less resourceful in making them.

There may be races, as there are individuals, whom persecution drives to progress—who do find means to execute unjust commands—but the people a Health Officer has to deal with can be better led by kindness and will learn from teachers, if the teaching is in the form of example or demonstration.

It is an incontrovertable fact that to hasten sanitary reform, it is only necessary to hold out the helping hand; to encourage the ignorant citizen to ask for instruction and direction, instead of placing upon them the task of making bricks without either clay or straw. There are times and seasons, and individuals, at which, and on whom the bludgeon must be used—the greater good covering the lesser evil—but such cases are less common than present practice would seem to indicate.

The tenement house mother who has only one pan for all her needs and one broken pitcher for all fluids, does not readily under-

stand why she must keep her milk bottle for milk only. Who is to tell her, so that she will understand?

The men may be shamed into cleaning up the back-yards and alleys by pictures of such conditions in contrast to what might result with a little effort. The famous Cash Register yards were started in this way. Neglected spots have been cleaned up all over the country by similar influences. Why does not the Health Officer take a leaf from this book of recorded good work and show conditions known to him? Is he afraid of hard words from the owner? He will have the approval and support of all good citizens.

Health Board regulations may be left at a house AFTER they have been explained, and a firm insistance on obedience may then have an effect.

Why should there not be a constant exhibit of the conditions found within the boundaries of the district, with the changes for the better indicated as soon as they occur.

The Health Board office is now in some out-of-the-way place, where few people ever go and where those who do go are frequently not welcomed. Has the Board ever asked itself why it is often so misunderstood, so hampered in its work? What Board will be the first to take an office on a busy street and put pictures and samples with clearly printed legends in the windows —examples of the evasion of the plumbing laws, on a T-joint pipe; photographs of a dairy barn; photographs of a street at daybreak, showing the few open windows, and the one or two, if any, open at the top—these would serve as texts for the newspapers' sermons, sure to be preached, and back-alley conversations thereon.

Why not? Rival water companies are allowed to show filters to prove their claims.

The basis of all successful sanitary progress is an intelligent and responsive public.

The problem is to visualize cause and effect to the ordinary individual, too absorbed in his own affairs to study out the principle for himself.

The success of the street cleaning brigade, tried for one season in Boston; the improvement in the condition of parks wherever receptacles for wastes have been placed; the tidy condition of

corner lots where civic improvement leagues have taken the matter up with the children—all point to a means neglected by the officials, and hence to wasted opportunity and delayed obedience to regulations.

For the position of Instructive Inspector, it goes without saying that a trained woman will be worth more than a man, since most of the regulations affect, or would be controlled by women.

But a gain in the speed of adoption of sanitary reforms would be comparatively rapid under a thoroughly qualified woman as Instructive Inspector, and that there will not be any great gain until such a measure is adopted is the firm belief of the writer.

Mrs. Wagner's work in Yonkers, begun in 1897 under the Civic League, is well known. After three years trial the Board of Health established her in the position of Sanitary Inspector. Her work in the tenement districts has been most successful. Several other cities have followed the example of Yonkers, but the practice is by no means general. Yet there is no doubt that it would add efficiency to any Board of Health.

The most recent experiment was the employment, the past summer, of an Inspector provided by the Woman's Municipal League of Boston, to inspect, and devise means for bettering conditions in a district of small shops where food is sold. This district had been found by the Market Committee of this organization to be in need of such help. The person chosen was a graduate of the School of Social Workers, who carried on her campaign with the spirit of helpfulness fostered by her training. She was given a badge by the Board of Health, who have been most sympathetic and cordial in their support. The experiment has been justified by the results and especially by the reception accorded the Inspector by the people of the district. It has proved that there is a responsive desire to fulfill the law wherever its provisions are understood.

Inspection cannot fulfill its purpose until it is instructive. Man and the law will be in accord when the benefits of the law to man are appreciated.

It is incumbent upon the sanitary authorities to see to it that their efforts are not wasted on an inert, partially hostile clientele.

THE VALUE AND SCOPE OF EXHIBITIONS AND MUSEUMS.*

By ALEXANDER M. WILSON,
Boston, Mass.

The exhibit is a method of educating the public in measures for the protection of health and safety that has been developed to a high state of efficiency within the past few years. For this development we are chiefly indebted to the organized campaign against tuberculosis, where it was quickly realized that something more dramatic in quality than printed tract and dry lecture was needed to catch and hold the attention.

The first of the tuberculosis exhibitions, and one to set a high standard in both scientific and popular presentation of the measures for the prevention and treatment of this scourge, was held in Baltimore in the late winter of 1904, under the auspices of a State Commission created to study the problem of tuberculosis in Maryland. The present Secretary of the Maryland State Board of Health was the executive officer of that Commission, and on him fell a large share of the responsibility for the success of this unique method of arousing popular support for the measures advocated by the Commission. McCoy Hall in Johns Hopkins University, was for a week turned into an exhibition room where several thousand persons were attracted and held for instruction. The Tuberculosis Committees in New York and Boston were quick to seize this new weapon in their warfare, and soon had exhibits travelling about from place to place. The Massachusetts legislature in the session of 1905 passed an Act appropriating $2,000 to be expended by the State Board of Health in an "exhibition of the means and methods of treating and preventing tuberculosis." The National Association for the Study and Prevention of Tuberculosis assembled material for a large exhibition in the New York Museum of Natural History in the fall of 1905, where an increased interest was aroused. At the close of the exhibition in New York the Massachusetts Board of Health transported the material to Boston, and in Horti-

* Read before the American Public Health Association at Richmond, Va., October, 1909.

cultural Hall gave what, up to that time, was the most successful exhibition in point of attendance. Twenty-seven thousand (27,000) persons passed into the building in the ten days it was open, and audiences taxing the seating capacity of its large hall attended the series of lectures. In their speeches the Governor of the State and the Mayor of Boston virtually pledged themselves to the support of advanced measures for the relief and control of tuberculosis—pledges which they notably redeemed.

The National Association's exhibit was thus launched on its long and successful tour of the large cities of the country. Today that Association has two extensive exhibits in the field, one in the South and another in the West. Several local and State Associations have exhibits and several State Boards of Health have adopted this method of educating the people about tuberculosis. The Boston Association's exhibit has been shown on thirteen occasions in Boston and 77 times in other cities, going outside the borders of New England to three places, Pittsburg, and Scranton, Pa., and Syracuse, N. Y. Its greatest activity has been during the past year when it has been shown in twenty-six places usually for a period of one week each.

The most elaborate health exhibition ever assembled was that held in connection with the International Congress on Tuberculosis in Washington, D. C., October, 1908. The unfinished National Museum was given by the government for its housing and the whole civilized world was drawn upon for material. To Drs. John S. Fulton and Henry G. Beyer are due the credit for the successful carrying out of this vast undertaking, made possible by the liberal financial support of Mr. Henry Phipps and others. But the high water mark of health exhibitions was yet to be reached. The Committee on Tuberculosis of the New York Charity Organization Society, loth to see this valuable material dissipated without performing further service, shipped the entire exhibition to New York where for seven weeks, November 30, 1908, to January 17, 1909, it broke all records for attendance. Mr. Lawrence Veiller, who directed it, adopted up-to-date advertising methods of successful business, and through the press and with posters, street car signs, sandwich men and other methods known to the advertiser made it clear to New York's multitudes that a visit to the Museum of Natural

History would be found profitable. This resulted in crowds such as never before found their way to that popular museum—crowds that on single days reached such astonishing numbers as 43,713 on Sunday, December 6th, and 63,256 on Sunday, December 27th. The total attendance for the seven weeks was 753,927, an average daily attendance of 15,386. The value of this demonstration of the effect of fresh air and cleanliness to the tenement dwellers of that great city can never be estimated but certainly it is great enough to make the cost of the exhibition, $35,278.26, pale into insignificance. One immediate effect was the reporting of an unprecedentedly large number of cases of tuberculosis to the city health department.

The success of the exhibition depends on the strong appeal to the imagination of graphic representation of facts and experiences. It has gained in interest and influence as it has increasingly called into use dramatic statement, models in three dimension in miniature and life size, the cartoon, motion and sound. Photographs are most effective when enlarged and having titles easily read at a distance. Graphic representation of statistics make their strongest appeal to the untrained mind when reduced to the simplest terms and drawn in heavy lines in color. The cube, sphere, cylinder, cone and pyramid standing out in three dimensions will give a lasting impression of size and numbers that cannot be conveyed on a plane surface. One of the most effective exhibits used in the tuberculosis propaganda has been the "contrast rooms" in life size. One is the room as found by the visiting nurse, with floor covered by an old carpet, the window darkened by a shawl, walls hung with old clothing, and bed covered with soiled bedding, the whole place favoring the spread of the disease by the consumptive who, we are informed, lived here. Close beside this is the same room after the nurse has effected its transformation—new paper on the walls, a rug replacing the carpet, clean bedding, a suggestion that soap, water and "elbow grease" had been administered in liberal doses, and an open window letting in health-giving sunlight. With placards pointing out the difference between the two rooms, and its meaning in terms of health to the occupant and his family, these rooms have never failed to awaken interest and to teach their lesson.

The same principle of contrast has recently been effectively developed by so-called "illusions." By a simple arrangement of lights and mirrors the bad room may be changed instantly into a good room, the transformation going on regularly at frequent intervals. Another striking illusion is that of a consumptive evidently in the late stages of the disease seen drinking from the cup chained to the public drinking fountain. As you are looking into the frame the man disappears and in his place is a young mother giving her child a drink from the same cup. We are only beginning to grasp the possibilities of teaching health truths by methods such as these. That there is a rapidly growing demand for live matter for exhibition uses is shown by the fact that two business houses are now advertising that they are ready to supply exhibition materials. The catalogue of one, describing illusions, electric flashing signs, graphophone records, and talking arc lights, is convincing proof that we have entered upon a new era in health propaganda.

Tuberculosis holds no monopoly of the exhibit method. We have already seen it employed with telling effect in crusades for clean milk, for dental and oral hygiene, while in Pittsburg a year ago the typhoid situation was brought out in a striking way. The "congestion" exhibit shown in New York and Washington within the year was a further demonstration of the effectiveness of this method, and today we find the director of that exhibition engaged by the Committee of One Hundred to prepare and give an exhibition of Tammany's corrupting influence in the politics and in the life of New York. Here again the newly awakened interest in health is appealed to by exhibits showing what Tammany waste in other directions might save if efficiently spent on her health and tenement house departments.

A permanent museum of safety devices and factory sanitation along lines successfully carried out abroad is being developed by the American Institute of Social Service in New York. Here, it is planned, factory owners, managers, and operatives may come to learn the most approved devices for safeguarding life and limb of workingmen. This material has been loaned on at least two occasions for exhibitions in other cities.

Militant bodies, it will be seen, have enlisted in the health crusade, unwilling to let dust accumulate on their material in

museums. So I will dismiss the last part of the subject assigned to me by expressing the hope that the youngest of us may live to take part in the establishment of a museum where the arms and accouterments of brave warriors against preventable disease will be collected as a memorial to their successful campaign.

SANITARY EDUCATION IN CALIFORNIA BY MEANS OF A TRAVELING RAILROAD EXHIBIT.*

By H. O. JENKINS.

This movement has been one of an educational nature. It has been a traveling sanitary exhibit sent out by the State Board of Health of California. The preparation was made by Dr. W. S. Snow, of Stanford University, Cal., and Dr. N. K. Foster, who at the time of the preparation of the exhibit was Secretary of the State Board of Health. After their return from Washington in December, 1908, they decided to put forward this plan. Dr. Snow was to contribute the time necessary for the building of the models and charts, and the State Board of Health was to provide the material and expense for construction of the exhibit, and provide means for placing it before the public. The construction went on for several months, and during that time the problem of the transportation of the exhibit was taken up. This was finally gotten rid of in a very ingenious method through the efforts of Dr. Rucker, of the United States Public Health and Marine Hospital Service, and Dr. Ainsworth, of the California State Board of Health. The Southern Pacific agreed to furnish a car, one of the regular passenger coaches in which the exhibit might be installed, and to furnish transportation over its lines in the State of California. The Santa Fe Company also agreed to furnish transportation over its lines within the State, and so by this means the exhibit could reach the many people through the State of California, and when we consider the dimensions of the State, that it is about 300 miles by a thousand miles in length, by way of the railroads, the problem was solved very nicely. I might say that the Southern Pacific Company has done everything to further the success of the exhibit.

First, I will speak of the immediate plan of the exhibit within the car, and I will say that it differed primarily from exhibits in the Atlantic states, in that it covered more generally

* Read before the American Public Health Association at Richmond, Va., October, 1909.

the ground, and emphasized a great many points in sanitary science and public health that have not been emphasized in some of the eastern exhibits. There were models of housing conditions that would favor tuberculosis. In nearly every case the model was supplemented by another model showing the proper conditions. Then there were models illustrating good and bad milk supplies. A model dairy was constructed in two parts one representing the poor dairy, one that might further typhoid and other diseases, and then another which showed a clean, healthful dairy. Then there were models of water sheds and water supplies of various kinds, built in relief map form to illustrate how contagion might reach the water supply. Then the exhibit was sent about through the State of California from last March until the present time, and is being continued to be sent about through the state, and will probably continue for four or five months.

The general plan of the work is this: The Division Superintendent is notified as to the stations at which the car is to stop, and the time we wish to give to the car at each place. Then the superintendent arranges the exact schedule. The car is hooked on behind some local train running between the stations, and the car then stops at some station for a day or two days or three days or a week, depending on the size of the town. The people are notified in advance through the local newspapers, and the local health officer and Chamber of Commerce men do all within their power to advertise it to the people. The car is thrown open certain hours of the day, and the people come down and demonstraters stand there and explain the essential features of the exhibit. I might say I think it reaches the people in a very efficient way, insomuch as it is an exhibit situated in the car, a great many curiosity seekers come to investigate what this curious object is, and after they get inside they become intensely interested.

I had the pleasure of being a director on the car for the period of three months, and I found that everywhere it was met with great appreciation. Another feature that we tried to carry out in this exhibit was that of constructing models of very simple matters. Waterpipe painted over and pipe of insulated wire, so that schools might use this method in demonstrating

sanitary laws, and it is a fact that five of the High Schools of California have taken up this method and have now permanent exhibits. The car is also sent to the Teachers' Institutes throughout the State, and in this way a few of the elements of sanitation are brought before the teachers. It has aroused a great deal of talk among the people of California and has done a great deal of good. It has caused the people to ask questions as to what the State Board was trying to do in health work. Then they discuss the work, and not only does this exhibit method teach facts, but it emphasizes necessities, and teaches investigation on the part of the people. In addition to the exhibit car the demonstrators are expected to make a brief sanitary survey of the cities they go through. When the car stops at some town a man will go out and visit the water supply and sewerage system of the town, the milk supplies, and in a few hours he will know more than the average citizen knows about his own town. In that way they are able to do more efficient work.

In addition to this the car carries a number of lantern slides, some one or two hundred, and a lecture is given upon request by the citizens. During the summer time the lecture is often given in the open air. The screen is stretched up between two trees, and the lecture given there, or in some hall. In this way the people are reached.

I do not know the exact cost of getting up such an exhibit. I am sure that Dr. Snow, Secretary of the State Board of Health, would be very glad to furnish anyone with exact information on that point. In regard to furnishing the car, I neglected to mention that the Northern Pacific Company fitted up this car by taking out the seats and placing tables on either side of the center aisle, on which the exhibit was placed, and at one end of the car a small office was partitioned off in order to keep the records of the car; furthermore the company furnished gas and water for the car and care of the car, together with transportation, agreeing to do so for a year after the commencement of the work.

SCOPE AND NATURE OF PUBLICITY AS A FACTOR IN POPULAR EDUCATIONAL MOVEMENTS IN PUBLIC HEALTH.

By JOHN A. KINGSBURY,
Assistant Secretary of the New York State Charities Aid Association.

The scope of publicity in public health is as broad as the scope of publicity in politics. The nature of such publicity differs but slightly from commercial advertising. Publicity, whatever its purpose, to be effective must be as striking as it is possible to make it. Please do not misunderstand me. I hold no brief for the patent medicine man with his yellow-journalism methods. Still, if only some of the methods of yellow journalism will succeed in getting before the public the simple facts and principles which the American Public Health Association stands for, knowledge which must be disseminated widely before you can hope for great progress in public health, then yellow journalism is of the nature and within the scope of proper publicity for this purpose. If you need be a little yellow in your methods, you can remind your critics that yellow is the color of prophylaxis.

Doubtless all will admit that the patent medicine man, through his friends and staunch allies, the yellow journal, the farmer's stable, the public toilets, the street cars and even the parks and the highways, has been more successful in commanding public attention to his wares, than has the American Public Health Association, in getting its proceedings before the general public.

What mother does not know Mrs. Winslow's Soothing Syrup? But where are the mothers among the masses that appreciate the meaning and value of pure milk? Point out the adolescent girl who is unfamiliar with Lydia Pinkham's Pink Pills for Pale People. Does she also know the simple rules of personal hygiene? Is there a sufferer coughing in a stuffy slum tenement who has not tried Father John's Consumption Cure? How many of these poor victims have yet learned the significance of the simple out-

* Read before the American Public Health Association at Richmond, Va., October, 1909

door life? I must not omit Peruna. Who has not unwittingly read a testimonial for Peruna—or at least started one, thinking he was going to get some thrilling bit of news. Perhaps some of you have even been asked to write a testimonial for Peruna. If so, I hope none of you were so guileless as Pat, who in response to such a request wrote as follows:

> Dear Dr. P. Roony: Oi have used three bottles iv your viluable rimidy, and it cured me iv worms—but oi now have snakes."

But what proportion of the reading public has even had an opportunity to read the proceedings of this great association of experts. I may be wrong but I venture the assertion that it is pitifully small as compared with the number who have read Peruna testimonials.

Now, if I am right in this assumption that the public is more or less familiar with the names of most patent medicines, and the particular value attaching to each, while being at the same time in comparative ignorance of what you have been trying to teach about pure milk, pure water, and pure food, about personal and public hygiene, about fresh air, rest and recreation, and about sewage disposal, and the kindred subjects of sanitation, then it is certainly not improper to ask: What is the explanation for this wide-spread wisdom on the one hand, and such appalling ignorance on the other? The answer is not far to seek. Professional publicity in the first instance. Lack of it in the second. Professional publicity along practical lines. Publicity that pulls is publicity that pays, and you must pay for publicity that pulls. That is what the patent medicine man understands better than we do, and that's why he succeeds better. While we will probably join in condemning Dr. "Father John" and his cult, as an authority on health, we must admit that he is a good psychologist and a skillful advertiser.

Perhaps the failure to secure publicity in public health is natural, the knowledge on which it is based coming as it does from physicians who are not supposed to know much about advertising. In fact, I think advertising generally is frowned upon as undignified by the medical profession, and I fear even now that I am being criticized for recognizing the element of strength of the

patent medicine methods. Nevertheless, success depends largely upon such methods, for the nature and scope of practical publicity are essentially the same in every line. Still, I grant you, publicity in public health should differ in at least two saving respects from the patent medicine type: It must tell the truth; it must be moral.

Within these limits I would almost say no method of publicity is undignified or unrefined. If Cardinal Woolsey were advising us on this point I fancy he would say, "I charge thee, fling away thy dignity if thou wouldst have successful publicity." If it were by pride the angels fell, it is by dignity that men often fail.

Assuming at any rate that you will grant that we must have more and better publicity if we are to promote effectively and efficiently the progress of public health work, let us consider for a moment more definitely the nature and scope of such practical publicity.

The direct aim of practical publicity must be the creation of new wants and new desires. We have a right to assume that if advertising can create new wants and new desires the satisfaction of which builds up business for others, practical publicity can create a desire for self-preservation. The methods of such practical publicity I will discuss under two heads. (1) General Publicity; (2) Direct Publicity.

General Publicity will aim to reach the public irrespective of locality, through the medium of newspapers and magazines of wide circulation; through billboards; through mass meetings; through conventions and conferences, such as this, all with a view to arresting attention, arousing curiosity and stimulating interest to the end that a new desire may be created. Let me illustrate by an example from the commercial field taken from a work of exceptional merit, by Truman A. DeWeese,* dealing with practical publicity. The man who made the first safety razor and ventured to put it upon the market had to spend a lot of money creating a new want in the minds of men. It was his lot to convince masculine mankind that they can emancipate themselves from the despotism of the barbershop. It was his

*The Principles of Practical Publicity, being a Treatise on the Art of Advertising, by Truman A. DeWeese, 2nd Ed. Geo. W. Jacobs & Co., Phila., 1908.

mission to point out the avenue of escape. It was his task to convince bewhiskered humanity that the safety razor is a practical thing—that it is a time-saver, a money-saver, a blessing to tender faces, and that it is possible for the man who cannot shave himself with the old-fashioned razor, to scrape his face quickly and smoothly with this new device. In other words, the maker of the first safety razor had to lay the foundations for all future business with an educational campaign.

It is our problem in public health to arouse a slumbering humanity to full realization and meaning of the frightful fact that disease germs cause the death of over 50% of the human race; that in addition to this awful loss of life there is suffering which can hardly be imagined; that the poverty incident to these distressing diseases is perfectly appalling. Humanity aroused to the full force of these facts, we must convince it that this sinful sacrifice of human life is almost wholly needless. Then may we confront startled humanity and say:

> "Duller wouldst thou be than the fat weed
> That roots itself at ease on Lethe's wharf
> Wouldst thou not stir in this."

We must get our facts before the public in such form that everyone will see them; everybody will read them; nobody can fail to understand them; no one can forget them; none can be comfortable until wrongs are righted. He who runs must see, read, understand, appreciate and remember, and this above all—he must act; act in the living present.

In putting these facts before the public we must do it much as the patent medicine man does it, bearing in mind that "occasional spasmodic spurts of publicity do not pay." It is the continuity of advertising that makes a patent medicine popular and gradually builds up a market for the product. Keeping everlastingly at it is what pays. "It is the constant dropping of the water of publicity that wears away the stone of indifference." We must make you need public health as much as Uneeda Biscuit.

In our publicity in the crusade for the prevention of tuberculosis, we never lose an opportunity to display the Double Red Cross, and we hope that it is now coming to have a meaning as definite as that attached to the Gold Dust Twins. There should be

more symbols suggesting public health, as the Double Red Cross now appearing on the public horizon suggests the campaign against tuberculosis. By these signs we shall conquer. They should be made as familiar to every country boy as is now the little dog listening to "His Master's Voice." Every child must come to feel that public health means money-saving, life-saving and blessing to humanity.

This is the function of general publicity in public health. It aims to lay the foundation of all future business of saving life, of restoring humanity to health and happiness, and of abolishing a large percentage of all poverty through a continuous educational campaign.

Right publicity, however, will do more than to attract attention and to interest. It will convince. It will create not only a new want. It will create a new demand as definite as the demand for the safety razor. But if only general publicity is employed in our work we may be doomed to failure in this respect or at least to a delay that is deadening.

We want to get results NOW; we want action; we want city, state and nation to clean house; we want pure water; we want pure milk; we want pure food; we want clean homes; we want clean streets; we want clean factories; we want fresh air, and we want sunshine; AND WE WANT THEM NOW.

To get these without delay, we must attract attention and interest; but we must also convince, and this is where direct publicity comes in.

DIRECT PUBLICITY in public health will confine itself largely to local issues; to applying the general principles to local conditions; to hammering the proposition home; to getting the locality into action. The attention arrested, the interest aroused, we must convince of specific facts and needs if action is to follow. This must be done by individual appeal and through personal correspondence, with a skillfully-devised system of follow-up letters, supplemented by effective circulars, attractive leaflets and winning booklets; by posters and placards; by lectures and by public meetings. Enlightened and aroused public sentiment must demand that conditions be improved in specific ways, and whatever brings this to pass, that is of the nature and within the scope of proper publicity in public health.

To illustrate what I mean by keeping everlastingly at it, let me read you a choice summary of direct publicity methods, which appeared in a paper in a city where we were about to hold a big mass meeting the other night for the purpose of laying out a definite constructive program for the prevention of tuberculosis. The article appeared under the striking headline, "NOT A PERSON CAN AFFORD TO MISS IT," and ran in part as follows:

"Although the power of the psychological impulse may not be conspicuous in its effect on this town's conduct today, it is altogether probable that by Monday night practically all Binghamton will have received so many hundred of these impulses, each couching in some way or other a suggestion or an appeal to attend the tuberculosis mass meeting in the State Armory at 8 o'clock, that to the tuberculosis mass meeting all Binghampton will just naturally gravitate.

"Here is a forceast of some of the psychological impulses you are going to get:

HOW THEY'LL GET YOU.

Tonight when you get your pay envelope you will be informed that a mass meeting will be held in the State Armory Monday night at 8 o'clock, when prominent authorities on tuberculosis will discuss the topics in an educational way. About 12,500 payees will be given impulse No. 1 in this manner. Then when you go home to read the paper, along with the notices regarding reduction sales of shirts, you will be confronted with the announcement that on Monday night there will be a tuber—and so on. Nearly every page in the paper will reiterate this morsel of enlightenment. Advertisements of clothes, shoes, hats, coal, books, furniture, hardware and baked beans will be alike in that respect; you will get the dope on tuberculosis with all of them. While supper is on you begin to get interested, perhaps worried over the big noise being made about tuberculosis. If you start for the theater in the evening placards in 300 show windows will bear to you the trite tidings of that mass meeting. The cards stand out in the electric glare, challenging the eyes on every side. People around you are talking about the meeting and as the curtain goes up, your spouse points to a reminder of it, printed on the program right under the cast of characters.

The matter may have left your mind Sunday morning, but you are soon taking in a warning from the pulpit that tuberculosis is something that can be downed by knowledge alone. Therefore your pastor exhorts you to go around to the mass meeting on the following evening.

Monday morning you no sooner leave the house than signs on the street cars begin reiterating the time, place, purpose and entertaining features of the tuberculosis mass meeting. Your companions on the job have heard the news and they tip you off that—what do you s'pose—that there's going to be a mass meeting. The first time you use the telephone central casually lets it drop, before making your connection, that in the Armory at 8 o'clock, and so on. By Monday night you have been directed, asked and exhorted to attend the meeting, advised of the advantages of going and warned what you'll lose by staying away. And if you are so obdurate as not to have been prodded or cajoled into deciding to attend, you will be swept into the Armory by the crowd's rush when, just before 8 o'clock a tuneful band parades the streets playing, "Throw Out the Life Line," and "Onward, Christian Soldiers."

But let me be even more concrete. How, for example, should the American Public Health Association go about it to organize an educational campaign for the promotion of the cause of public health? My notion would be to maintain active national headquarters, preferably in New York City, and, if possible, with offices in the United Charities Building; have a competent staff under the direction of a well-paid and efficient secretary. Then proceed very much as the National Association for the Study and Prevention of Tuberculosis has done: Send out exhibitions, conduct educational campaigns in all the leading cities, and keep up the continuous campaign of general publicity. Organize a branch association in every state where none exists. Set your state branches at work carrying on local educational campaigns in all the more important cities and villages, organizing local public health asscoiations, and in turn keeping the local press everlastingly at it.

To keep the newspapers everlastingly at it, is the most important, simplest, and the least expensive single thing which may be done in the publicity campaign in promoting the cause of public

health. Let me outline a scheme for a state; From Rowell's Newspaper Directory obtain a list of all the papers. After carefully classifying them according to the size of cities, dailies, weeklies, monthlies, etc., select from your list the papers which you can afford to supply a regular weekly, bi-weekly, or even monthly press bulletin, according as your funds permit. On the official stationery of your association write the editor a frank business letter setting forth the nature and purpose of the cause you desire to promote. Enclose your first press story, which must be very carefully written by a professional newspaper man, if possible. Ask the editor to publish it. Ask him if you cannot count upon his co-operation in the future. While newspaper space is a rather expensive commodity if you attempt to buy it, you will find the editors of most newspapers more than generous in providing space for the promotion of any cause such as the improvement of public health. If funds are available, this press notice should be issued weekly, dated for release at a certain specified time, preferably at midnight of Saturday, as the newspaper columns are not usually crowded with real news matter on Mondays, and your story is more likely to be printed in full. But it should be newsy and breezy, and not editorial in its style. The amount of space you are given will depend largely upon this point and the care with which it is prepared, thus saving the editor the necessity of revising it. As a matter of fact, I have been told by editors of some of the leading papers in New York State that they will gladly publish this material whenever space permits, if it does not require any editorial revision, that is, if it has the least semblance of being news.

The mechanical work necessary to the preparation and distribution of this bulletin is simple. It requires only the multigraphing, the folding, enclosing, sealing, stamping and mailing. The entire expense connected with issuing such a bulletin to, say, 500 papers once a week ought not to exceed eight dollars. Assuming that half of your papers, or even a quarter of them publish on an average one-half of your story (for they will often cut it in two) surely you will grant that this is cheap publicity.

Returning to my original position: I maintain that it is a great pity to have so much good material as is being turned out by organizations such as the American Public Health Association

almost going to waste so far as the general public is concerned. We should recognize the practical ordinary business principles and get our goods into circulation. I fear that many of our great philanthropists, our social workers, our national medical and public health associations, all too frequently fail to have a proper regard for practical business principles. In these days of big business organization what factory forgets to plan for the marketing of its products? Apparently failing to realize that the principles of business should be the principles of philanthropy, some of the most successful business men the world has ever known have made possible the establishment of great institutions for the production of scientific information without having made any adequate provision for marketing that valuable product. The Rockefeller Institute for Medical Research, The Henry Phipps Institute—these great institutions are at work refining truth and producing knowledge; but have they given due attention to the importance of creating a widespread demand for these wares? So far they seem to have left it to the more or less meagre efforts of social workers to market their product; and it is true that in some lines we are trying hard to create a market for it. It is only within the last few years that there has been any considerable demand for the knowledge given to the world almost a quarter of a century ago by the great Koch, but now people are beginning to clamor for it. There is an undue congestion of unused product in most of these great factories. The public demand is yet lacking, but the public demand must be created by the application of the principles of practical publicity. As I said in the beginning, we must learn from the patent medicine man. Let his good work be the undoing of his bad work.

The trouble thus far is that all the money that has been given to this field of work has been put into the manufacturing department, and the advertising end of the business has been almost entirely neglected. If we are to get results we must get the goods into circulation, and to get the goods into circulation we must have a larger appropriation for the advertising department of our business.

Moreover, there is now a lack of proper co-operation between the producing and the advertising departments in the great business of public health. This is a vital weakness in an organization

of any sort of business, and it must be remedied if ultimate loss is to be avoided. To employ again the language of the man who made Shredded Wheat famous, "The manufacturing organization and the advertising must be co-ordinated on a smooth-working and effective basis. There must be harmonious action between them. They cannot be dissociated in any successful scheme for marketing a product. They cannot work to cross purposes. The selling force must follow up the advertising campaign, and the advertising campaign must be planned and conducted with reference to trade conditions."

The American Public Health Association has long been in the business of producing knowledge of inestimable value—values that may be measured by lives. Its storehouses are filled with a product for which the public can be made to clamor. I repeat, if advertising can create new wants and new desires the satisfaction of which builds up business for others, surely practical publicity can create a desire for self-preservation, and the nature and scope of such publicity within the bounds of truth and morality should be limited only by its ability to get results.

DISCUSSION.

Prof. BURRAGE (Lafayette, Ind.). I would say that we have in our small college community at Lafayette, Ind., a college paper which has a circulation of approximately 1500. This fall we interested the students in the health question, and they put in a "Daily Health Tip," not over three or four lines in length, which the Professors in Hygiene furnish the students with. We find that this has caused a great deal of favorable comment all through the State of Indiana. I would suggest that this is a good way to reach a student community. The students will read the college paper where they would not read other papers, except perhaps the sporting page. Dr. Evans of Chicago instituted the daily health hint in the Chicago Tribune, or the Tribune instituted it with his assistance. From the short experience we have had we find it very successful at Purdue University.

THE PRESIDENT. In the little State of Rhode Island we have a traveling tuberculosis exhibit, which we can drive from one end of the state to the other. We suggested this idea to some people in Texas and they objected because of the great distance in their state. The Texas people are very much interested in this exhibit in California.

The purpose in bringing out this symposium is shown very markedly by the presence at that exhibit in New York of some 7,000 people. Seventy thousand school children saw it, and went home and told their parents about it. Something to attract the eye and suggest to the mind ideas which we want to give them is preferable to something which will not attract the eye.

Dr. KNOPF. The value of public lectures on any health topic with the view of educating the masses, particularly in tuberculosis, is no longer questioned. It has been my privilege during the last twenty years to deliver not a few public lectures on such subjects and I have not been spared some rather painful experiences. What I have learned from these experiences is that it is not so easy to talk the language of science in the language of the people, and no one who attempts to lecture on such a subject as tuberculosis should do so without having made

himself familiar with common expressions for the scientific meanings he intends to convey to his audience. If possible, the lecturer should be a physician, although physicians are not always good lecturers. Nevertheless, with a little experience or a few lessons in elocution they usually do very well, and the public has more respect for what is said when it comes out of the mouth of a physician than when it comes from a layman. If the lecturer is a fairly fluent speaker it is better for him to speak extemporaneously, but a well read paper is preferable to an incoherent extemporaneous address.

It does not do to lecture on tuberculosis in a badly ventilated room. You want to select your place carefully; one of easy access, a public hall, a church, if the church is well ventilated, and some of them are not, or a school room. A church is best suited for the purpose. People like to go to church, and if the lecturer is not too earnest, not too scientific, if he intersperses his lectures now and then with humerous remarks, it does no harm. Clean humor is as divine as clean earnestness. A little of it often suffices to wake the people up if they happen to be asleep. We must make our lectures popular, interesting, nay even entertaining, perhaps even inspiring. Our lectures dealing with the health and welfare of the masses, oftentimes delivered in the interest of the poor, should appeal to the heart as well as to the mind. In tuberculosis lectures, for example, you have to appeal very often to the heart because you need a lot of money for the work and the needs and care of the consumptive poor, and you can't get it by appealing simply to the mind. If you appeal to the heart and mind and soul of your audience you are reasonably certain not to appeal in vain.

THE NECESSITY OF SOME EFFICIENT MEANS OF CHECKING SYPHILITIC AND GONORRHEAL CONTAMINATION.*

By Dr. JUAN BRENA,
Zacatacas, Mexico.

The comparatively recent establishment of the fact of the "spirochoeta pallida" being the causal factor of such terrible diseases as general paralysis, tabes dorsalis, etc., has considerably accentuated the importance of syphilis and demonstrated the tremendous necessity of placing at the disposal of preventive medicine all the means capable of checking the spread of that scourge, which is a poison to future generations.

The efforts of associations like this would be fruitless, without the co-operation of the social classes sufficiently instructed as to the power of scientific advances and the magnitude of the calamities which they may arrest. In the efforts for the extermination of complaints like leprosy or tuberculosis, whose victims inspire only sentiments of compassion, people join spontaneously and with best will in support of the hygienist. The same does not happen when it is proposed to check the diffusion of venereal disease. Unyielding notions as to modesty, or ideas of reprobation and repugnance towards the sufferers, predominate in their minds, and the public shows itself to be luke-warm or abstains altogether from taking part in the task of carrying out sanitary regulations. The result of this is that the syphilitic patient, from the dread of humiliation, conceals his sufferings from those around him. This fact has been prejudicial to the public health and has thrown obstacles in the way both of the limitation of the number of the persons infected and of the lessening of the ravages of the disease. Fortunately, at the present time, conviction has grown as to the practical utility resulting from giving universal publicity to clear rules establishing precisely the conditions which renders immune the communication between healthy and venereal subjects.

* Read at the meeting of the American Public Health Association at Richmond, October, 1909.

It is a matter of common sense that, in order to free ourselves from an enemy, it is necessary to know who he is and by what means he attacks us.

The literature on this knotty sanitary question is already very extensive, and the opinion is unanimous in favor of the efficiency of precaution against the spread of the contagion, such as supervision by the authorities over houses of prostitution, the strict observance of special regulations and frequent inspection of the prostitutes, in making general and compulsory registration of all public women.

It would therefore be superfluous to dilate on the advantages of these regulations of sanitation. I come merely to call attention to the necessity of adopting in our respective countries, precautions in use in others, with certain modifications, and of availing ourselves of school teaching in order to instruct the young regarding the dangers and consequences of the infection.

In Germany, the society for fighting against venereal disease has provided for the free distribution of a pamphlet which sets forth instructions for safeguarding against contagion. In the United States, Dr. Cabot has proposed that a similar publication be placed in the hands of every patient on entering the hospital. There is no doubt that the dissemination in this way of the knowledge of the evil will to a great extent, be influential in eliminating danger of it.

The ignorance which has shrouded the mechanism of the propagation of syphilis would the more easily be dispelled by not limiting the enlightenment to the patients, much less only those who take refuge in the asylums, or seek aid in the dispensaries. The prophylaxis should be known to all, and I am of the opinion that the municipal authorities would do well in taking care that in every locality circulation be given, by means of the druggists' shops, to pamphlets on the subject, and that at regular intervals, public lectures and conferences be given of a similar nature to those which tend to inspire in the working classes aversion to vice and love of work and thrift. In these lectures it should be explained how easy is the transmissibility of syphilis and gonorrhea, their severe character, and the tenacity with which they take root in the system.

The error in supposing that the system has been freed from the poison merely by the cicatrization of the visible lesions by means of local applications or medical treatment of short duration, should be combated. Today no specialist will admit that a cure properly so-called has been effected without a specific treatment having been followed for a period of time varying from three to eight years, which fact is ignored by many.

In language adapted to the intellectual level of the audience, a review should be made of the ordinary localization of the virus. Dividing the subject into themes for the different meetings, a general description should be given of the lesions of the region which serve most commonly as the original point of attack of the disease, and later on, of the multiple effects all over the body; ulcerations of the joints and bones, loss or aberration of the senses, injury of the cardiac valves, and lastly, complete loss of the intellect and of all activity in the general paralysis, divers *paraplegia, or tabes dorsalis*. It has been said that it is not by the fear of physical pain that the passions or caprices of men will be governed. Still, I am of opinion that some of those who attend such lessons would, on approaching their lips to the apple of Paradise, prudently withdraw, remembering the cry of warning of the hygienist, not less protecting than that of the poet:

"*O pueri fugite hinc,* * * * *latet anguis in herba!*"

Perhaps also, due to the profound impression produced in the mind of the hearers by that particular kind of instruction, a solution might be reached in many cases and by those interested, of the problem so much debated by medical jurists, as to syphilis in its relations to matrimony.

Having shown the horrors which are the habitual accompaniments of syphilis, we will pass on to the methodical cautions as to prophylaxis. Any family having a venereal patient in its midst should take care that he sleep alone. Such patient should be the only one to make use of his knives, forks, glasses, clothes and brushes. Nobody should put to his lips objects which have been touched by the patient. This last advice includes the patient kissing anyone, more especially children.

All the foregoing should be minutely recommended. This is a case of speaking like the apostle Paul, with the mouth open,

and it is necessary that no one should be unaware that the sexual act is not the only way of contracting the disease. Some time ago a law regulating prostitution was put in force in Denmark. The practice of prostitution is not considered punishable, but a woman is prosecuted for vagrancy who cannot show an honest way of earning her living. The municipality of Copenhagen furnishes doctors to treat the venereal patients free of charge, the latter having the right to claim professional attendance. This last feature of the regulation has been very badly received by the majority of doctors, who see in it an official monopoly of a branch of the profession, which implies for them pecuniary loss. It is not likely that a similar regulation would give rise to the same objection amongst us. But even if it did, the sacrifice would be small in comparison with the probable results, and by the time when in the ordinary expenses of every municipality there appears a sum sufficient to meet the gratuitous care of venereal subjects, we shall have attained a position which will mark an epoch in sanitary science.

It is generally conceded that pupils in schools should receive lessons explaining the evils resulting to the healthy by abuse of tobacco and alcohol. In deference to morality, whose doctrines are always found in accord with the best precepts of hygiene, it will also be a meritorious work to instruct the older pupils as to the deadly and destructive action of impure pleasures. The teachers should exalt chastity as a virtue which raises the nobility of human nature, and should speak of the moral responsibility of those who, possessed by the demon of the flesh, bring on themselves innumerable evils, make themselves objects of horror to others, and curtail the duration of their own lives. The infamous traffic of clandestine prostitution will be discussed as the principal origin of syphilitic and gonorrheal contamination.

If we could succeed in inculcating in the young the aversion due to that leprosy of society, we would considerably reduce the area of the waves of venereal infection. By this we do not mean that the commerce with "*puellæ publicae*" inscribed in the police register could be regarded as without danger to health. The little book which the authorities give these women in order to permit them lawfully to follow their calling, does not imply an undeniable proof of health. It is simply a patent, which like

many commercial marks, circulates "*sans garantie du gouvernement.*"

In conclusion I submit to the consideration of this learned assembly the following proposition:

The official delegates here present will bring to the notice of their respective governments:

(a) The advisability of the incessant repression by police authority of excessive libertinage.

(b) The importance of profuse and free distribution by means of druggist-shops, dispensaries, and sanitary associations, of pamphlets giving instruction as to the extreme gravity and the prophylaxis of syphilis and gonorrhea.

(c) That it be made obligatory for municipal doctors and others appointed for the purpose, to attend venereal patients free of charge.

(d) To supplement the official programme of secondary studies by lectures or addresses regarding the transmissibility of, and difficulty of curing syphilis and gonorrhea, pointing to clandestine prostitution as the most active source of contagion.

I am not blind to the possibility that the last of these suggestions may meet with opposition owing to the strength of traditional prejudices; the methodical teaching of the scientific principles necessary to the prevention of evils so long hidden and shrouded in mystery may be looked upon as a scandal and an outrage upon modesty and public morality. No such consideration should deter us, however, in the furtherance of the immense good which may be gained by this course. Inexperience causes infinite harm to the young. Let us not fear to help them and guide them, however thorny be the road; science is ever pure, perfect, immaculate as chastity.

THE NECESSITY OF ISOLATING PROSTITUTES WHO SUFFER FROM SYPHILIS.*

By Dr. JOAQUIN HUICI,
Mexico City.

The prophylaxis of syphilis is one of the most serious and interesting questions of hygiene, as it is of vital importance to public health, and at the same time includes a social problem which has given rise to earnest discussion between prominent men of science and has divided them into two parties: Abolitionists, who only look to the question of individual liberty and therefore defend the free exercise of prostitution; the other party who advocates the enactment of regulations, looking upon the question from the double point of view of morality and health and therefore maintains the advantages of bringing that vice under regulations.

Under both aspects we can consider the disorders and injuries arising from prostitution as well in the moral as in the physical sense. In the former case, the advocates of that individual liberty are combated on the ground that the exercise of this vice as at present permitted, offends the modesty and virtue of woman, as well as the innocence of youth, renders her unworthy of a home, deprives her of the sweet title of wife and deprives her of the holy rights of maternity. The latter aspect of the case is that such an exercise wounds humanity in its physical essence, communicating to it such terrible diseases as syphilis and gonorrhea.

Of all transmissible diseases, syphilis is that which has undoubtedly caused most ravages among the human race; it attacks man in the full vigor of life, segregating him for a time from society, rendering him useless for work and making him a certain vehicle for the disease which he takes with him to his home and there contaminates his wife and engenders beings who do not reach their full development, or if they are born, bear with them the well defined stamp of a sickly constitution which

* Read before the American Public Health Association, at Richmond, Va., Oct., 1909.

very soon terminates their existence, or allows them to live under the constant menace of an unfortunate inheritance. Gonorrhea, which was formerly considered a mere local affection of no importance, is today known to proceed from a pathogenic germ that is capable of invading the entire system, and by preference the articulations, but which can also extend its malign influence to the serous membranes of the heart, the meninges, and produces sterility in both sexes, whenever it spreads from the urethra to the whole of the generative organs.

Bubonic plague, cholera, yellow fever and other contagious diseases, generally assume an epidemic form, attacking a great number of persons at the same time, causing an exaggerated number of deaths, but always for a limited time. We now have a knowledge of their methods of transmission, and by putting into practice the different means which are now at the disposal of science to avoid their propagation, they may be made to disappear. Syphilis, on the contrary, ever since we have had any knowledge of its existence, has never ceased to manifest itself, causing numberless victims in all parts of the earth, and its only vehicle consists in those individuals who have been selected to become its victims, and therefore is only communicated by the direct contact of one person with another, by the use of utensils which have been contaminated by the sufferers of the disease, or else by inheritance. With regard to other diseases, hygiene can rely on general or special means for preventing their propagation. The bubonic plague can be extinguished in a comparatively short time by the strict isolation of the sick and the disinfection of the rooms which they have occupied, and is prevented by the destruction of the animals which serve as a vehicle for the germ of the disease, as well as by the injection of the serum which gives immunity, even though only temporary, to those who receive it. Yellow fever has been suppressed throughout the Mexican Republic as well as in other places in which it had made its deadly influence felt for hundreds of years, by the isolation of the persons who suffered from it and the destruction of the transmitting mosquito in the houses, or the larvae in water receptacles. Cholera, which is transmitted by the "comma bacillus" contained in the excreta of the patients, is suppressed by the disinfection of that excreta. Smallpox is

prevented by the use of the Jenner vaccine, which confers immunity for a long period of years; diphtheria by the injection of a serum which produces immunity, even though for only a very limited time, and in both cases as well as in those of typhus, scarlet fever and measles, by disinfection and isolation; but against syphilis and gonococcic affections, we have, up to the present, discovered no serum or vaccine which will confer immunity, and their highly contagious character, renders it very necessary that we should provide against their transmission.

Of all the precautionary measures which I have above mentioned, we can apply to this disease only that of isolation, because its transmission requires the direct contact with persons suffering from it, therefore this is the means to which we can have recourse for that end, and it must be specially applied to the public women who constitute the most abundant and fruitful source of those dreadful diseases. It is true that the syphilis infection does not proceed exclusively from that source, as it is not only the woman who is endowed with that fearful privilege, but man can also communicate it and in fact does so, and therefore it would be just to submit him also to isolation. At the same time we must agree that the social conditions are so different with regard to the two sexes, that what we can easily apply to one would be out of the question with the other. As a general rule, the man is the one who maintains the family and therefore requires to work for that purpose, and it would not be fair to deprive him of the means of furnishing that sustenance by confining him in a place where he could not work. On the contrary, the prostitute trades with her body, either for pleasure or for the purpose of providing for her own subsistence, and in the place in which she would he isolated, she would have means with which to live, as they would be furnished to her without having to think of obtaining them for herself. We can easily understand that, if she is left at liberty under circumstances that require greater resources to provide for her subsistence and cure, she will do her best to attract a greater number of visitors, who will become victims to the disease and in their turn carry it to others, although on a smaller scale, as the men cannot have that contact with the same frequency as the woman, especially as certain manifestations which do not cause her any suffering, are very painful to the

man and constitute in him a physical impediment against sexual intercourse. Moreover, supposing that a woman recognizing that she was contaminated, and through the mere scruple of communicating her disease, should be endowed with such good sentiments as to abstain of her own free will from that intercourse, as the initial manifestation of this disease, chancre, is eminently contagious but at the same time rarely perceived by the woman who does not know that she is the bearer of the germ, only a physician through his special investigations can discover the contagious condition of the prostitute. It is therefore indispensably necessary to submit these women to a careful and constant supervision in order to discover the evil at its commencement and to place them under such conditions that they cannot communicate it; that is to say, isolate them.

But in order to establish and carry out with all the necessary rigor, this prophylactic measure which is so efficacious with regard to venereo-syphilitic diseases, it is indispensable to adopt three measures which absolutely impose themselves, as follows: In the first place, the obligatory registration of all women who live by prostitution; in the second, the periodical inspection by a physician at frequent periods, and lastly, the confinement in a hospital of all those who may be found affected or even suspected, of any contagious disease.

The irrefutable figures of statistics have already demonstrated, that in nations like Belgium, France, Germany and many others, in which prostitution is brought under regulations, and the women who exercise it are subjected to the above measures, syphilis has decreased to a remarkable degree.

Numerous facts could be cited in support of the above assertion, but in order to demonstrate it, we need only remember what took place in Italy during the last years of the century which has just closed, and in which country, after the repeal of the regulations which governed prostitution, syphilitic diseases increased to such an extent that, three years afterwards, thousands of people demanded the re-enactment of those regulations, which were from that time put in force. According to the observations of Tarnowski, a notable Russian professor, during the first year of absolute liberty, the percentage of sick soldiers, which previously reached 4.25 per cent, had increased to 10 per

cent. Amongst the civil population during the last year of the regulations, 5,916 sick persons were attended in the hospital, who were suffering from some form of venereal and syphilitic diseases, whilst in the following year, under the rule of free intercourse, their number reached 7,570 and in the following year, ascended to 7,764. This shows that the number of sick suffering from these diseases increased 96 per cent in the course of two years.

In the City of Mexico, and during the quinquennial period of 1902 to 1907, with about 3,000 women registered, the medical inspections numbered 212,955, resulting in the discovery of 10,888 sick, of whom 7,778 were suffering from venereal, 1,828 from syphilis, whilst the others were doubtful or simply suspected. All these women are sequestrated in the "Morelos" hospital, which is exclusively dedicated to the attendance of women of this class.

If we take into account, that each one of these prostitutes, if allowed her liberty, could have contaminated five or six individuals, we reach an enormous number of thousands of men who, thanks to the medical supervision, have been preserved from contagion.

Are not these figures sufficient to justify the isolation of these women who are in every way noxious to the community, and who do not suffer any serious injury through their detention in a place in which they are humanely treated, properly fed and attended during the course of the disease, by medical specialists of well-known reputation? It is to be observed that their stay in the hospital is not very long, because as soon as the manifestations which might give rise to contagion disappear, they are dismissed, and their liberty is not dangerous to the community, because they are still kept under vigilance, and are again sequestrated as soon as fresh manifestations present themselves.

In view of all these considerations, the Mexican authorities, anxious to procure the disappearance of infecto-contagious diseases by hygienic methods, or at least to diminish their propagation, has not confined itself to the active campaign which has been undertaken against bubonic plague and yellow fever in the ports, typhus, scarlet fever and other contagious diseases in the capital, but greatly impressed by the increase formerly seen in

venereo-syphilitic diseases, from the last third of the past century, has adopted the system of regulating prostitution, tolerating it under the condition that those who may adopt it as a business, will submit to the provisions of a set of regulations which have for basis the three measures above indicated: obligatory registry, periodical medical inspection and forcible confinement to a hospital in case of sickness, and this without neglecting prudent police measures for the defense of public order and morality.

Now, when an active campaign is being carried on throughout the world against the ravages of this dreadful disease; when the entire community is called upon to co-operate towards that noble purpose, by founding societies in which young people will acquire a knowledge, through public lectures, of the dangers of that repulsive disease; when free dispensaries and clinics are established and maintained, in which the victims can easily obtain gratuitous advice and attendance for the re-establishment of their health, why should those measures not be universally adopted, which, if not in themselves sufficient to prevent the evil, certainly must take a prominent place amongst the resources to be employed for its disappearance?

I am well aware of the agruments employed in the anxiety to defend the rights of individual liberty on the one hand, and by an exaggerated sentimentalism on the other, as suggested by the opponents of these coercive measures of preservation; but we must agree that, dealing with an evil of such transcendent importance, we must sacrifice certain rights and set aside all sense of pity, when dealing with persons who fully understand their abject condition, know that they are acting contrary to the moral laws, and that by the very reason of their shameful trade, find themselves unable to claim rights which they are unworthy to enjoy, and therefore must give something in compensation for their exemption from persecution, such as they were subject to in ancient times. Although it is true that nowadays we do not look upon prostitution as a crime, it certainly is so, to communicate to others diseases which would work to their injury. A notable hygienist says that prostitution, considered as a social necessity, is a peculiar condition which places those who exercise it in a situation which is comparable and almost analogous to the condition of the unhealthy establishments which the com-

munity and the authorities have the right and duty to watch and regulate.

Another of the arguments which is brought forward against the measures I refer to, relates to its arbitrary and unjust character, seeing that it is applied to women alone and not to the men who are equally guilty; but I have already observed that the conditions of the two sexes are entirely different, and that as regards the former, the objections will not apply which do apply to the latter, and that the execution of such measures would be entirely impossible as regards the men.

It is also said that such measures would be insufficient, in view of the fact that it would be impossible to subject all women who live by prostitution to their action, whilst the number of clandestine prostitutes is greater than that of those who register. This is unfortunately true and somewhat difficult to prevent; but can we infer from the fact that we can only isolate a comparatively small number, that we should leave all at entire liberty to propagate their diseases with impunity? This would be as much as to say that we should not punish a delinquent because many others escape from the action of the laws. There can be no doubt that the prophylactic measures which I refer to, if applicable to all individuals suffering from that disease, would be sufficient to cause its disappearance, just as other diseases disappear when such measures are energetically applied; but in view of the impossibility of attacking this sickness in all its foci of contagions, we have to satisfy ourselves with the decrease of its ravages, and apply those measures in those cases which are within our power.

As regards the rights of individual liberty which are invoked, we must bear in mind that many of the police provisions which are enacted for the good of the community, also imply an attack on that individual liberty. We can thus classify the quarantine laws which so greatly injure persons and interests and are enacted to prevent the entrance of exotic diseases; the isolation which is so rigorously carried out as regards sick people suffering from bubonic plague, cholera, etc., separating them from their families, precisely in those moments when they have the greatest need for their services, and turning them to the care of hired people, who generally are not distinguished for their charity or

love of their neighbor, and depriving the families, in the event of death, of the consolation of being with their beloved in their last moments. All this is also an attack on individual liberty, and nevertheless, nobody opposes those measures as arbitrary or unjust, and they accept them because they know that "to protect the interests and health of the majority, even though such protection may infringe the rights of some, is a condition under which the community can exist, and it is the duty of the authorities to assert themselves and enforce those provisions which, however arbirtary they may appear, tend to the prevention of greater evils."

Comparing the injuries which are suffered by nations through the introduction of exotic diseases, whose consequences are so terrible, with those which the community suffers through the evils of prostitution, it would be very desirable that, in those International Conventions which are held for the purpose of adopting universal measures for the defense against those plagues, agreement should also be reached for the establishment of a uniform set of regulations to control the exercise of prostitution, to defend ourselves at the same time from that other social plague which unceasingly propagates moral deterioration, whilst at the same time it undermines the physical constitution of the race, degenerating it and opposing itself, up to a certain point, to its reproduction.

CONCLUSION.

It is a world-recognized axiom that governments are under the obligation to enact all provisions which may tend to prevent the propagation of transmissible diseases. It is a fact that syphilis and gonorrhea are continually transmitted from contaminated persons to those who are healthy, and therefore those diseases should be held included in that obligation; and as public women are the principal source of those diseases, they are the ones to whom such provisions should be applied.

SOME CONSIDERATIONS ON VACCINAL SYPHILIS.*

By Dr. FRANCISCO BERNALDEZ,
Mexico City.

The Jenner or arm to arm vaccination employed as a prophylactic against smallpox has been discredited in almost all nations, for the supposed powerful reason that it may inoculate the syphilitic virus as well as the anti-varioloid. As a matter of fact, it has been well proved by observations (cases related in Fournier's work "La Sifilis vacunal") and by the experiments of Drs. Cory, Sperk, etc., that syphilis can be transmitted by arm to arm vaccination, but to begin with, we must observe that these unfortunate cases have occurred in a very small proportion as compared with the immense number of people operated upon, and at a time when, in the belief that this slight operation was entirely innocent, no proper precautions were taken, and it was often practiced by laymen. We are now well aware that, in order that arm to arm vaccination may not carry with it syphilitic inoculation, it is necessary to observe certain precautions, decided by special experiments and observation. These precautions must be well observed by the physicians in charge of the vaccination service, the only ones who should be permitted to collect the lymph, even though its inoculation may be practiced by other persons. This recommendation with regard to the Medical Staff charged with the collection and preservation of the humanized vaccine lymph must also be extended to the staff who collect and preserve the animal lymph, as cases have already been seen and are recorded in the literature relating to this class of vaccine, showing that with it the germs of other diseases can be inoculated, such as tetanus, tuberculosis, suppurations, septicaemia, etc., which can only be prevented by bacterioscopic and bacteriologic examination, as well as by the autopsy of the calves. It can be easily understood that these examinations of the lymph and of the animal from which it is taken can be made only by persons properly instructed in these operations. On

* Read before the American Public Health Association at Richmond, Va., October, 1909.

the other hand, it is well known that in order to destroy the foreign germs which may exist in the lymph recently taken from calves and which may develop in a person vaccinated with it, such as general septic infections and local suppurations in the point of inoculation, use is made of glycerine and the aging of the lymph, two methods through which the lymph partly or totally loses its immunizing power. Of this we find a proof in the epidemic of smallpox which occurred in the City of Torreon, State of Coahuila, when persons who had been vaccinated with animal lymph, with apparent success, were attacked by that terrible disease, and the epidemic did not disappear until the animal was substituted by the general vaccine. The success of the latter vaccine is attested by all the inhabitants of that city, amongst them a large number of American citizens.

Coming back to the vaccinal syphilis, which is the subject of this paper, as I have already stated, the humanized vaccine can serve as the vehicle for the transmission of syphilis only when precautions are not taken to prevent it, as only under certain conditions relative to the person who furnished the lymph is it possible to carry the virulent germs of syphilis and inoculate the person to be vaccinated. The selection of persons who are to furnish lymph, must only be made from amongst the children, who can be in a position to transmit syphilis only when they have inherited it, or when, even though they may not have it by heredity, they have been inoculated with the germ of the disease, by vaccination. In the latter case, which is precisely the one which we desire to avoid but that might remotely arise, the eminent Russian specialist on this disease, has demonstrated, and with him all the students who have followed his experiments, that the disease can not be transmitted with the vaccine lymph if it is taken from pustules of seven days' growth. According to the Russian physician above mentioned, his experiments have demonstrated that the time which the incubation requires to produce the specific virulent infiltrations through the contagious character of the syphilis, is not less than nine days, so that if the vaccine lymph is taken from pustules of seven days' growth, it is impossible to inoculate the syphilitic virus, because it has not yet completed its period of incubation and has not had the necessary time to provoke and produce the specific infiltra-

tions in which a great number of the treponemas of syphilis are found. Dr. Sperk concludes from his experiments that: "The unfortunate cases in which syphilis has been inoculated together with the vaccine are explained by this fact, that the lymph has been taken from a pustule which was already complicated with syphilitic infiltration; in all the literature relating to vaccinal syphilis, there is not a single proved case in which the disease has been transmitted if care has been taken not to collect the lymph from pustules of more than seven days' growth."

The other case in which the transmission of syphilis is possible by vaccination is when the child from whom the lymph is taken has inherited the disease. It is well known that the syphilitic manifestions when this infection is hereditary make their appearance during the first three months of life, and therefore, the children from whom the lymph is to be taken must be selected from amongst those who have passed that age, and if, as a very rare exception, the child who has inherited the disease does not present traces of it at that age, it is because it might be in a latent condition; but in such a case the vaccine does not transmit the syphilis, as has been well demonstrated by the bacterioscopic studies of the lymph which have been made in the Central Office of Vaccination of the Supreme Board of Health of Mexico by Dr. Gutierrez Perrin. This learned bacteriologist, in the course of 172 bacterioscopic investigations of the treponema in pure vaccine lymph taken from syphilitic children, obtained negative results. If by any accident the child who has inherited syphilis and whose diathesis is in a latent period, bleeds at the time when the vaccine pustules are scarified, the lymph is thrown out, and this practice should be systematically followed with all vaccinated children in order to have greater certainty of not transmitting the disease, even when it has been scientifically demonstrated that in the latent condition the blood of syphilitics (Finger) is not virulent; because even in those cases in which syphilis is in full eruption, accompanied by other manifestations, it requires a large quantity of blood (10 c. c.) to find some treponemas. On the other hand, amongst other experimental investigations, Dr. Gutierrez Perrin has made the following: A syphilitic patient presented a very generalized eruption of papulous, vesiculous, and pustulous exanthemat, in which he

was able to obtain a typical vaccine pustule on a papula. The microscopic preparations made with the pure lymph taken by scraping the pustule and with blood from underneath it gave a negative result as regards the treponema. Similar results are given by Dr. Horand in his work on "Sifilis and Cancer" (1908, page 32), who, on this subject says: "In the pus taken from a syphilitic from a non-specific lesion, if not mixed with blood, such as blennorrhagic muco-pus, adenopotic pus from the groin, liquid from the non-hematic vaccine pustules in newly-born children who have inherited syphilis, we have found no treponema. This is a confirmation of the ideas of the clinical observations of Rallet, Schrair, Montain, Bidart, Taupin, Viennois, Horand Sr., Barthelemy and Balzer."

From the above observations we infer the practical methods which are to be followed in the selection of the persons from whom we take lypmh. They must be over three years of age, that being the age at which hereditary syphilis makes itself apparent; the vaccine pustules must be of seven days' growth because the contagious syphilitic infiltrations have a longer period of incubation; when scarified, the vaccine pustules must not bleed, and if such an accident happens, the hematic lymph must be thrown away, notwithstanding the fact that it has been scientifically proved that the blood of persons in whom syphilis is latent, is not virulent. From the above we find that, the transmission of syphilis through the agency of humanized vaccine, can easily be avoided if we know the conditions under which such transmission is possible. The Temreriane vaccine is therefore to be recommended, because it is superior to the calf or animal vaccine, on account of the conviction we have that it confers a greater degree of immunity, and that in the majority of cases, this immunity continues as long as the vaccinated persons live.

THE SECOND DECENNIAL REVISION OF THE INTERNATIONAL CLASSIFICATION OF CAUSES OF DEATH.*

By DR. CRESSY WILBUR,
Washington, D. C.

(ABSTRACT.)

All the time allowed will not be taken up discussing the subject of the International Classification as copies of Census Bulletin No. 104 on the mortality statistics of the year 1908, containing the preliminary report of the Census Commission of Revision at Paris and also the official English translation of the tabular list of the revised classification, is to be sent to each member of the American Public Health Association. The full extent of the changes in the classification cannot be judged until the Revised Manual has been published.

The Second Decennial Revision of the International Classification of Causes of Death, in which twenty-three nations of the world joined, is by far the most important event affecting vital statistics that has occurred during the past year; the possibility of this was largely due the American Public Health Association. Its recommendation of the Bertillon system of classification at Ottawa in 1898 was the determining cause. A large amount of work was done by the Association prior to the first revision of 1900, yet no official recognition was given it and the Commission for the United States was not informed of the date of revision until after its occurrence.

By special provision of an act passed by the present session of Congress, recognition was given the Section on Vital Statistics of the American Public Health Association, organized in 1907. In accordance with its terms, Dr. Wilmer R. Batt, the Secretary of the Section on Vital Statistics, was appointed as one of the three Census delegates to the International Commission at Paris. This official recognition by Congress is undoubtedly extremely gratifying to all.

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* Read before the American Public Health Association at Richmond, Va., October, 1909.

The general form of the revised classification was not greatly changed from the first revision. A large number of the titles are identical in form and contents. No general rearrangement of the group of general classes was attempted, as we are not ready for such a course. A scheme of nomenclature of causes of death should precede the statistical classification. The Committee of the American Medical Association is conducting the preparation of a national nomenclature of diseases and causes of death which will give a firm foundation for the future of vital statistics in the United States.

The titles of the tabular list of causes of death in the International Classification can readily be subdivided to meet the special requirements of different countries or cities. Pneumonia, as an example, can be subdivided as desired. So also in the special subdivisions of deaths from accidents. It was strongly recommended that cerebrospinal fever or epidemic cerebrospinal meningitis be transferred to the class of General Diseases. The American delegates were very anxious that this change be made, but as the International Commission had acceded to the proposition that all meningitis should be kept together, it was very undesirable to transfer simple meningitis to General Diseases. As there is no class of "Infective Diseases," although many of the diseases of Class I, General Diseases, are infective, the retention of epidemic cerebrospinal meningitis among diseases of the nervous system is not so illogical, in view of the impossibility of making a satisfactory separation of this cause. As classes are passing into disuse, it is predicted that they will finally be abolished for a plain practical list of important diseases and external causes of death.

It is urged that approval of certain changes in the present standard certificate of death in regard to cause of death and occupation of decedents be made. No wonder our occupational mortality is still largely an unknown quantity.

The standard certificate was born in the American Public Health Association in 1901. It was at once adopted by the States of Indiana, Michigan, and New York, and indorsed by the Bureau of the Census, and it is rapidly extending over the United States.

The American Public Health Association and its Section on Vital Statistics are progressive. No sooner is one problem solved or in way of solution, than another presents itself. Last year the Section's attention was mainly absorbed by the International Classification of causes of death and the adoption of important Rules of Statistical Practice. This year the adoption of a revised standard certificate of death ranks first, and next year the most important practical measure would be the preparation of a series of uniform statistical tables relating to births, stillbirths, deaths, sickness, marriages and divorces. We shall have with the beginning of next year a revised classification of causes of death, a revised standard certificate, and also a new classification of occupations, and we now possess in full operation and general acceptance the code of Rules of Statistical Practice, the only authoritative standard of practice for registration officers that has ever been available in the United States.

The value of uniform statistical tables is enlarged upon and it is shown how by their use the present chaotic condition of the presentation of vital statistics will be done away with.

The value of strictly following the Rules of Statistical Practice of the American Public Health Association is shown.

Reference is made to the American Statistical Association. It has been proposed to officers of this Association and to the members of the Council of the Section on Vital Statistics that they co-operate by the appointment of special committees whose work can be greatly aided by the Bureau of the Census for the preparation of drafts of uniform tables for registration reports and bulletins. In this connection mention is made of the International Congress on Hygiene and Demography.

Progress is shown in the extension of the registration area, eight States having been added since 1905, one of which will first be included in 1909.

Attention is called to the supreme necessity for adequate registration of vital statistics in the South as well as the North.

DISCUSSION.

Dr. H. W. HILL: I would like to ask Dr. Wilbur exactly how he attempts to phrase that part of the death certificate which asks for the cause of death. We have been discussing that in Minnesota, and I would be glad to know what the recommendation is.

Dr. M. L. PRICE, Baltimore, Md.: I would like to ask Dr. Wilbur what numbers in the International Classification of Deaths were changed in the last decennial revision, what the present numbers are, and exactly what they are intended to mean in their classifications.

Dr. WILBUR in closing the discussion said: Mr. President, in answer to Dr. Hill's question I will say that there was a joint meeting of the Committee on Forms and the Council of the Vital Statistics Section, and a complete agreement was had as to the form of questions for cause of death. The note printed on the face of the blank is as follows: "State the disease causing death, or, in deaths from violent causes, state (1) means of injury; and (2) whether accidental, suicidal, or homicidal."

In answer to Dr. Price's question, I have received this noon a communication from the Census Office stating that Census Bulletin Number 104 had been printed and one hundred copies had been sent to me. This contains the titles of the classification, and each title which has not been changed or modified from the former series is noted by an asterisk. Dr. Price can see what changes have been made.

CO-OPERATIVE EFFORTS IN THE SUPERVISION AND CONTROL OF MILK SUPPLIES.*

By FREDERIC D. BELL,
Lederle Laboratories, New York.

It has for some time seemed to me that no group of business men was quite so careless and indifferent to their individual interests as the milk dealers of New York City.

To illustrate what I mean, consider the conditions in New York City. The Board of Health regulates the milk industry by Section 56 of the Sanitary Code, which reads as follows:

> "Sec. 56. No milk, modified milk or cream shall be received, held, kept, offered for sale or sold and delivered in the City of New York, without a permit in writing therefor from the Board of Health, and subject to the conditions thereof."

These regulations have all the force of the State law. The dealer applies to the Board of Health and obtains a permit or license to sell milk. This permit is issued with the understanding that it is revokable at pleasure. He may keep his permit so long as he conducts his business in accordance with the provisions of the Sanitary Code, with the rules and regulations of the Board of Health, and in accordance with the laws of the State. If he does not conduct his business in accordance with all these requirements, he is summoned to court, fined, possibly imprisoned, and warned that a repetition of the offence will result in the loss of his permit.

Should the Board of Health revoke his permit, he is without a means of producing an income, and if he attempts to sell his business it will be at a great sacrifice. Probably his entire capital is invested in this business. To the average dealer this means annihilation, unless he can make his peace with the authorities and have his permit renewed. By a stroke of the pen his income is entirely wiped out and his capital largely depreciated, if not wholly destroyed, and why? Because

* Read before the American Public Health Association at Richmond, Va., October, 1909.

through his ignorance, his indifference, his carelessness or short-sightedness he has taken absolutely no steps to learn and to know that he is conducting his business in accordance with the legal requirements.

How many milk dealers do you know who systematically examine the milk sent them from the dairy farms or creameries, to ascertain its butterfat and total solids content; its freedom from preservatives or its compliance with bacteriological requirements? I venture to say that you can count them on the fingers of one hand. The average milk dealer knows little or nothing about the chemistry of milk, and still less about its bacterial inhabitants.

This, briefly, is the general condition of the New York City milk dealer as respects his knowledge of these subjects and their relation to the conduct of his business. The problem is submitted in this very general way so that I could point out, in the remarks following, some of the means by which the Health Officer or the Health Board might co-operate with the milk dealer to better the conditions and to gradually put him and his business on a much higher plane from a sanitary standpoint.

There is a marked tendency on the part of certain Health Officers to strive for the ideal, without regard to the practicability of such campaigns. If this is the case, they are probably striving for an almost impossible ideal so far as milk is concerned, that is, a rich and practically sterile milk. It is my belief that the widespread production and general distribution of such a grade of milk, at the present time, is practically impossible for several reasons.

First. The public is not sufficiently educated to exact this quality of milk, and without a sufficient demand for it, there will be no attempt on the part of producers to furnish such a supply.

Second. The public is unwilling or unable to pay for such a grade of milk; unwilling, because it does not realize the importance of having such a quality of milk, and unable, because to produce such a grade of milk would bring its price above the means of the average milk consumer.

Third. The dealer and the average producer of today are not of a type capable of producing this quality of milk. They

do not understand what clean milk is, nor have they very much idea of how to go about producing it.

Fourth. Neither the dealer nor the producer can conduct his business except there be a margin of profit in it. The cost of producing and selling milk leaves a very small margin of profit, at its present selling price. Increased cost would wipe out this profit unless the selling price were correspondingly increased.

Fifth. The average dairy farm is too small to produce milk economically. The well-known business principle of effecting large economies from the large production of any given commodity under one control can be made applicable to the production of milk. The day is coming when some of our bright and capable business men will realize this situation and will go back to first principles, so to speak, and start large diaries where all the economies can be practiced that naturally come with large production. Where it also will be possible to employ scientific help for the control of the supply both from the chemical, bacteriological and sanitary standpoints.

Sixth. The present dairyman and dealer, except those doing the largest business, are unable to afford any systematic laboratory supervision. The cost of such would practically do away with the comparatively small profits which they are now making. Without such supervision, it is impossible to produce this grade of milk.

Seventh. The average dairyman and dealer are unable to afford the proper buildings and apparatus which are necessary for the production of a pure milk supply.

Eighth. The average dairyman cannot afford the loss of tuberculous cattle which may be found in his herd. Instances are reported where 90% of certain herds have been found to be tuberculous. Very few dairymen can afford the loss of this proportion of their productive capital.

These are some of the more important reasons why it would now seem impossible to obtain the ideal milk for all classes.

There is a tendency on the part of some health authorities to overlook some of these practical points and to insist that clean milk is what their city must have, and that it must be produced in certain more or less ideal buildings, under more or less ideal conditions and with more or less ideal apparatus. Some of these

men frankly say that the commercial problems do not interest them; that from a health standpoint they must insist on practically sterile milk, rich in butterfat, produced under sanitary conditions and delivered in sealed, sterile containers. Instances are numerous where practically impossible regulations have been promulgated by health authorities which, if rigidly enforced, would mean that the cities or towns in question would be without any adequate milk supply. The insistence upon regulations with which it is impossible to readily comply, and for which the authorities themselves can offer no practical solution, seems absurd.

These matters are not mentioned for the purpose of decrying the efforts of such authorities to obtain the cleanest and purest milk possible for their communities. In fact, I wish it very emphatically and distinctly understood that I expectantly look forward to the time when all milk will be as clean and wholesome as scientific knowledge and practice can make it. The purpose in pointing out these things is to show how distinctly antagonistic the actions of so many health authorities are to the producers and dealers in this commodity. The Health Officer is considered their natural enemy by these men. This attitude should be entirely changed and, instead of the milk dealer and producer considering the health officer as his enemy, he should be brought to consider him as his friend. Such a feeling can only be brought about by obtaining the confidence of the dealer and producer. First, and foremost, the Health Officer can help to bring this about by waging a vigorous campaign of education with the consuming public. This he can do by the usual methods of publicity of which Health Officers and those in authority have learned to avail themselves. Through such mediums he can direct the attention of his public to the dangers of an impure supply, and the possible transmission of disease through dirty milk. He can point out the conditions responsible for such milk, that is, the unsanitary barn, the unsanitary methods of milking and caring for the milk until it reaches the consumer, the improper and unclean methods of handling containers, the use of polluted waters for washing cans and bottles, and many other such things. He can contrast these conditions with those that are more or less ideal, and which are to be found in some of

the dairies producing certified milk. By such a contrast he can induce, from time to time, a larger and larger number of his public to demand the better supply. He can, and should, point out along with these facts, that clean milk costs more to produce and that the consuming public must pay more for it.

This campaign cannot be waged in a day or a week, or possibly a year. The Health Officer should feel the pulse of his public and should not go faster with his campaign than his public can be brought to absorb the lessons taught. As rapidly as he can impress some of these facts upon the consumer, just so rapidly he may increase the stringency of his regulations with the confident hope that they may be complied with fully and heartily.

Not only can he educate his public, but he can educate the dairyman and the dealer. They need to know all that the public should know, and they need to know even more. They must be brought to see that certain types of buildings, certain pieces of apparatus, certain methods of milking and handling of the supply are necessary to produce clean milk.

Where the health authorities have laboratory facilities, these can be offered to the dairyman and dealer for the making of tests both to determine the chemical constituents and the bacterial content as well. By such laboratory examinations, the dealer can check up the dairyman and learn whether or not the milk thus supplied meets the requirements of the existing laws and regulations. Incidentally, this furnishes the Health Officer with similar information, and by fostering a feeling of friendship and co-operation with the dealer they can work together to weed out such of the dairymen as deliberately adulterate or who are by lack of training incapable of fulfilling the first requirements for the production of a clean supply. Such a co-operation will surely bring about better conditions.

The Health Officer should not neglect his own education. To assume an air of "knowing it all" is not only unwise but positively foolish. Rapid advancement has been made in the addition to our scientific knowledge of this food product in the past decade. This progress is likely to continue, and he who enforces the sanitary regulations should keep abreast of the times. As a concrete example of what I have in mind, I would like to cite the instance of a large dealer in New York who, barely

three years ago, spent not a single dollar on scientific control of his milk supply. His confidence was gradually obtained and he was induced to scientifically study his supply. Today he is spending at the rate of several thousand dollars per annum for such scientific control. Recently he stated that it was his hope and wish and present aim to double his present expenditure for such examinations stating, at the same time, that he believed the money thus spent was the best investment he had ever made. What this man has done could not be done by the average dealer, but the health authorities could make available their laboratories, to a very large extent, for such work and thus make it possible for each and every dealer and producer to have what now only a very few indeed are able to afford.

HOW AN ENLARGED AND MORE UNIFORM NATIONAL HEALTH ADMINISTRATION MAY BE SECURED.*

By JOSEPH Y. PORTER, M. D.,
Lt.-Col. Med. Corps, U. S. A., Retired, and State Health Officer of Florida.

(ABSTRACT†).

The cynical spirit of distrust of Federal supervision in public health affairs is seemingly not confined to any particular part of the country. Formerly it was thought that only those States lying to the south of the historical "Mason and Dixon's Line" were peculiarly sensitive to the doctrine of States Rights, and alone resented Federal interference with the special police powers of a State; yet it is apparent today that the States of Massachusetts, Ohio and Illinois, and others located above the mentioned parallel of latitude, are much more jealous of the prerogatives of State Sovereignty when applied to sanitary matters and the control of disease producing conditions within their confines, than are the States of the Southern and Southwestern part of the country.

Notwithstanding the fact that eminent jurists have tried to define the scope of authority possessed by the Federal Government in restraining the spread of disease between the States, and in certain instances within the State, when connected with or bearing upon interstate traffic, yet there has seemingly ever been a hesitancy on the part of the General Government to insist upon the enforcement of Federal Sanitary Regulations if in the slightest degree they conflicted or were in opposition to those prescribed by the State Health Authorities, or to supersede or to set aside the constituted Health Authority of a State by Federal management unless solicited or requested by the State's Executive—the Governor—to do so.

This difficulty which obstructs the General Government in caring for the welfare of the people can be met and overcome by each state asking for an amendment to the Federal Constitu-

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tion to permit without question the enactment of laws by Congress carrying ample power for the exercise of authority sufficient to cover every detail of a sanitary administration. When this is accomplished then will the General Government be in a position to remove a reproach which is being constantly directed against the Nation: "That more pains are now taken to protect the health of farm cattle than of human beings."

It is not believed that there will be any objection raised by the several states to ratifying an Amendment to the Federal Constitution by which

> "The Congress shall have power to supervise and control all matters affecting the public health of the citizens of these United States, whereby the life, health and physical discomfort of the citizen is or may be endangered.

By advocating an enlargement of the powers of the General Government in health control throughout the country, but which shall be uniform and impartially administered to all sections of the country, excepting none, it is not herein desired that the arguments advanced or the opinions expressed shall be understood as recommending or advising that the Health Police Powers of a State shall be abridged or superseded by the General Government, but rather that some of the defects in the present system of administration may be remedied and the awkwardness of many existing conditions be corrected.

DISCUSSION.

Dr. JOHN F. ANDERSON. Mr. Chairman, the paper has brought out very clearly one point, and that is, the constitutional limitations of the Federal Government. There are two points, which he quotes from Prof. Fisher's address, in which the Federal Government can take part, namely, investigation and education. The investigation part of it is very well advanced by the different Government bureaus in Washington, but I am sorry to say that that relating to education at the present time is not what we desire. I am sure that we all agree with Dr. Porter that this constitutional amendment he suggests is most desirable.

SOME OBSERVATIONS REGARDING THE MARITIME PROPHYLAXIS OF PULMONARY TUBERCULOSIS.*

By A. MATIENZO,
Of the Supreme Board of Health, Tampico, Mexico.

Whenever a case of bubonic plague, cholera or yellow fever appears in any country, the others are agitated and prepare themselves for their defence by mobilizing armies of physicians, by establishing sanitary inspection on the land frontiers and strict quarantine in the ports, with disinfecting stoves in strategic points and by taking other extraordinary measures. But there is another evil which is much more to be feared that the above mentioned scourges which modern hygiene, with the perfect knowledge which it now has of their etiology, can control with certainty and of these we find brilliant examples in my own country, as witness the epidemic of plague in Mazatlan and the complete suppression of yellow fever in Veracruz. The victims of this disease are counted by thousands, but nevertheless it does not receive the attention it merits from the Governments, nor are any such extreme precautions taken against it, as against those I have mentioned. The reason is that this grave evil, this social pest which we call tuberculosis, and which decimates our children, destroys with unfailing certainty our youths and does not respect old age; which one moment carries off the robust and hearty agriculturist and the refined inhabitant of the cities, and on account of its very grave character occupies the first place in the mortality statistics of the civilized world, is looked upon by us as an inseparable guest so that we contemplate with indifference its enormous ravages and crossing our arms, we give ourselves up to its attacks. It is therefore of interest that, in this meeting whose unselfish mission is no other than the study of the methods to preserve the lives of humanity, whether individually or collectively, from avoidable disease, and whose powerful voice is always heard with respect, we should again deal with one

* Read before the American Public Health Association at Richmond, Va., Oct., 1909.

of the many points which are covered by the immense field of preventive hygiene of the white plague; I refer to the maritime prophylaxis of tuberculosis.

* * * *

Tuberculosis is contagious; we cannot otherwise explain the frightful mortality which it causes in all countries and races, and which is the direct result of its being the ONLY EPIDEMIC DISEASE that is not, in any part of the world subjected to the indispensable measures for preventing the development of every transmissible disease; isolation and disinfection. Not to mention more than one example, tuberculosis causes during the year in the United States, in that country of liberty and wealth, the loss of about 200,000 inhabitants; between the ages of 20 and 45, that is to say, at the age when man is most useful to the community, a third of the deaths in the City of New York, that wonder of modern times, are due to tuberculosis. The exact figures are 14,408 deaths in one year, whilst typhoid fever, meningitis, diphtheria and all the eruptive fevers together hardly reach the half of that enormous figure. But there is another example which is even more eloquent as regards the great epidemics of this country; yellow fever, whose ravages are so much to be feared, and which until the verification of the Finlay theory, was one of the greatest obstacles to the progress of the fertile coasts of Latin-America, caused about 100,000 deaths in 115 years, whilst tuberculosis in those same countries and in only one year, caused 160,000. From the discovery of the Koch bacillus till two years ago, according to the famous experiments of Cornet and Flugge, the contagion by the respiratory tracts was a generally admitted axiom and the infection by the air was considered in the great majority of cases as the only means by which the bacillus could enter the system; but still more recently, Berhing expressed an opinion that tuberculosis was not contracted in this way, but was almost always the result of an intestinal infection contracted in infancy and developed many years after. As the digestive organs of a new born child have not the means of defence which an adult enjoys, the maternal milk is converted into the principal vehicle of the germ and sole origin of the tuberculosis, for which reason we should not take into account either the hereditary

disposition or the entrance of those germs through the respiratory tract. Numerous experiments show that the cultivation of the bacilli absorbed with the food, in spite of the perfect integrity of all the digestive mucous membrane, produced infection of the mesenteric, crural, and tracheo-bronchial ganglia. These last would be a deposit to which would come all the lymphatics of the lower members and abdomen.

Other experiments support the Behring theory and prove another important fact, that the carbon dust introduced by way of the gastric tract in some animals, may very well go through the intestine, the mesenteric ganglia and afterwards reach the lung.

Having perfectly demonstrated the infection of animals through the digestive tract, and the emigration of the bacillus to the lung, we nevertheless cannot infer that this same process takes place in man, and that we would in future have to abandon the direct infection by inhalation. Such a result would therefore render necessary an almost total change in our present plan of defence against tuberculosis, and the abandonment of many of the preventive measures whose favorable results are beyond question. On the other hand, the observation of the facts that we every day witness does not confirm such an exclusive theory; in fact, we cannot admit the development of those fatal cases of tuberculosis in adults, whose origin goes back to the first months of life, often without hereditary antecedents, and in which the bacillus must have lived for many years in a latent condition and in perfect compatability with a perfect state of health.

The well known experiments of Cornet and Flugge, reproduced by other experimentators have proved, on the other hand, the contagion through the dust charged with bacilli or particles of saliva expelled by the patient; the even more recent studies of Lenori and Camus, carried out under excellent conditions for research, in every way corroborate the conclusions of this theory. Knowing the mechanism of the contagion through the digestive tract, and also that an atmosphere saturated with bacilli is one of the principal factors in the propagation of tuberculosis, we must also know the favorable conditions for contagion, and not one of them is more important—without mentioning the soil or individual, hereditary or acquired disposition, as it has

nothing to do with maritime hygiene—than that which relates to the unhealthy dwelling, seeing that maritime prophylaxis has to be practiced on board the ship, a floating house in which we often find the necessary factors of crowding and mephitic air for the development of the disease.

According to Juitherat and Renon the frequency of death by tuberculosis is in proportion to the height of the house and directly depends on the free spaces which surround it. Tuberculosis is more frequently found on the ground floors than on the upper floors. It has also been seen, that the open spaces in the cities, such as gardens, squares, river banks, only exercise an influence on the health of the houses in their immediate neighborhood; but it is worthy of note, that they exercise no influence whatever at a distance of 25 metres and in those dwellings which are separated from the open space by a simple curtain of houses or by a street. This fact is explained by the other that the sun's rays only fall on those dwellings which front on the open space and confirm the saying that "tuberculosis is above all things the disease of the dark," an unquestionable axiom, as said by Renon, and perfectly demonstrated by the fact which we all know, that a cultivation of bacillus cannot develop except in the dark, and that however weak it may be, the light considerably attenuates the virulence of the germ.

We have seen that tuberculosis, that great and real plague, is the most deadly of all diseases; that it is produced by a bacillus and is eminently contagious; but that in order to flourish in fertile soil, it indispensably requires certain conditions, amongst which the most important is the unhealthy dwelling, the "condemned house," without air or light. Well now, to enter fully into the present subject, we can say that modern ships which cross the seas by the hundred, carrying thousands of persons under their decks, are nothing more than floating cities, with streets and houses, some of which are certainly situated on what, by analogy, we can call open spaces, bathed in pure air and solar rays, but on the other hand, there are many which open into dark passage ways, and in which the healthy and the sick dwell for many days in the most frightful promiscuity. An eminent hygienist says that tuberculosis at sea runs fast, that is to say, that under the detestable conditions found in a ship, contagion is

easy and its evolution is rapid. We who live in the ports and frequent the shipping, can very well understand the axiom of Rochard.

Maritime prophylaxis of tuberculosis, which is still relegated by the public authorities to a secondary place, really constitutes a complex problem of difficult solution, because it is of such very great importance for the reasons above given, that it justifies everything that may be done to suppress it even though the result may be barren or at least delayed greatly in showing itself.

The perfection of the hygienic conditions of large centers of civilization, and the preservation of communities against the ravages of transmissible diseases, are matters that constantly occupy the attention of individuals and governments. International laws are enacted and precautions against epidemic diseases are subjected to strict methods, but the legions of persons suffering from tuberculosis cannot be detained or isolated; from the very nature of their disease they obtain free entrance thus granting them the right which they unconsciously exercise of propagating their disease and infecting their neighbors. The progress which has been realized in the means of communication, the wonderful rapidity of maritime transportation, have made the voyage a necessity for the man of this period, and we can easily understand that he now exposes himself to infections from which he formerly escaped. It is therefore time for us to formulate a maritime prophylactic hygiene with reference to tuberculosis, and which would be based on the improvement of the sanitary conditions on board the vessel and its ventilation and lighting; the medical inspection of the passengers in the port of departure, so as to establish the diagnosis of the disease, and lastly, the isolation, of course comparative, of the sick passenger or immigrant in special departments. These rules would only apply to the large vessels which are dedicated to the transportation of passengers and emigrants, because in cargo vessels and the navy, the selection of a crew would render impossible the shipping of tuberculosis subjects. Having demonstrated that tuberculosis is a social danger, and that it finds at sea, excellent conditions for the breeding of the germ which propagates it, we propose to this learned meeting, that it enter on a discussion of the following preventive measures:

First. That offices for medical inspection should be established in the principal ports, under the control of the sanitary authorities, who will be fully authorized to examine every passenger in order to form a diagnosis and permit his embarkation under certain specified conditions.

Second. To require the great steamship companies to establish in all their ships, a special department with berths for tuberculous patients, by adapting their existing material or establishing something entirely new. These berths would have to be situated precisely on the ship's side, would have only one bed, waterproof floors, sanitary spittoons and be capable of being hermetically closed for disinfection.

Third. The infection by the air having been proved, this is all which should occupy the attention of the hygienist, so that, besides the measures above described, notices should be fixed all through the different departments of the ship, prohibiting, under heavy penalties, that old and inveterate custom of all people, of expectorating on the floor, and in the special berths for consumptives, some concise precepts, such as would impress themselves on the imagination, as to the dangers carried by the sputum, both for the patient himself as well as for everybody else.

PROPHYLACTIC MEASURES IN EXANTHEMATIC TYPHUS.*

By GENARO ESCALONA,
Mexico City, Mexico.

Although it is well known that the subject I have selected is not of equal interest to all the countries represented in the Association, it is certainly of special interest for some and may be so for all, in view of the epidemic nature of this disease, which has invaded certain points of the United States, for example.

In the central table land of the Mexican Republic, where it assumes an endemic form, it is the subject of great attention on the part of the sanitary authorities. The number of its victims is very great and the mortality which it causes reaches a high figure.

In passing I may state, that the physicians in Mexico who have made a study of typhus, are agreed that it presents certain characteristics which are different from those of European typhus. I may cite a few of these characteristics, as follows: that the disease does not have a sudden development; that in the fever cycle there is a period of ascension and another of descent through irregular oscillation; in the majority of cases the eruption is outward; the character of the pulse (hyperdicrotic, perfectly dicrotic, hypodicrotic, etc.), according to the stage of the disease, are probably exclusive to it, whilst amongst the digestive symptoms we frequently find diarrhea.

This shows the importance of not permitting the development of a disease with these characteristics, without identifying it at once; because if its manifestations are somewhat different from those of European typhus, it is probable that this arises from the different surroundings, such as climate, etc., although its ravages are very similar.

In all the following considerations, we must bear in mind that, up to the present, the agent which produces the disease in question is unknown, and therefore its habitual dwelling and biology are also unknown.

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There are three important points to be considered in the study of the prophylaxis of exanthematic typhus, as follows:

I. The sanitation of the towns.

II. The disinfection of the premises occupied by the patients.

III. What is to be done with the patient, with articles which come in contact with him and with those which are soiled by his excreta.

I. The first point evidently comes within the duties of the Government, and they have attended to it with an encouraging success in civilized nations. Fundamentally, it consists in the drainage of the sub soil, and in carrying the sewage far from the towns by means of drains, which operation is greatly assisted by copious flushing. This is what has been done in Mexico, where the drainage of the city and valley combined contribute to this purpose and have produced good results.

The good construction of the pavements also contributes, because in proportion to the ease with which it is washed and the frequency of such washings, is the scarcity of pathogenic micro-organisms kept in suspension in the air by the currents which are formed.

Another important point consists in the supply of drinking water as well as that required for domestic purposes, and there is no need for me to speak of the advantages of such a supply. In Mexico we are about to finally establish an extensive water supply which will come from some springs near the Capital City, and from which the city will obtain an abundant supply for many years to come.

Carefully taken statistics have demonstrated that one of the factors which most influence the development of the endemia and contribute to its decrease, is to be found in the rains which contribute to the washing of the streets. If this washing is artificially made, it will give similar advantages.

I do not insist on all the hygienic rules which must be kept in mind in town hygiene because they are well known and apply to diseases of all kinds.

II. It is the duty of the sanitary authorities, in part, and of the attending physician as well, to advise and require that proper steps be taken with regard to the rooms occupied by the patients. They are similar to those which are observed in cases

of the known infecto-contagious diseases, such as scarletina, smallpox, etc. Whilst the disease runs its course, these measures will be reduced to limiting the number of pieces of furniture in the sick room; to the suppression of the decorations on the walls, floors, doors and windows (curtains, carpets, etc.), to renewing the air as far as possible, and to the cleaning and disinfecting of everything which may be soiled by the patient, and especially the floor.

Once the patient is well, all dust will be carefully removed from the walls and ceiling; the floor will be well cleaned and some disinfecting substance will be sprayed all through. In Mexico we use a diluted solution of bichloride of mercury. Whenever the rooms will allow it, the first washing should be made by an abundant sluicing with a hose, as is done in the General Hospital of Mexico. If the disease has spread from any building, such as a shed, for example, it would be best to destroy it by fire.

III. With respect to the patient himself and the articles which come into immediate contact with him, I have something more specific to say.

As up to the present date, we have no knowledge of the mechanism of the pathogenesis of typhus, we cannot say with any precision what is the most efficacious method of preventing a patient from becoming the origin of new infections. This brings up the debated question of the contagious character of the disease. It appears to be a well established fact that the direct contact with a patient is seldom injurious. On the other hand, we also know that the clothing which has been soiled by the perspiration, excreta, sputa, etc., does actually produce typhus, exactly as happens with the clothing of patients suffering from other diseases, for example, dysentery. Bearing this in mind, the precautions must be similar in the two cases; it is now believed that typhus is not a morbous disease but a syndrome, and until bacteriology says the last word on this point, clinical science can do no less than advise that precautions be taken with exanthematic typhus, similar to those taken with regard to other fevers of the same character:

A. Isolation of the patient.

B. Prompt disinfection of his personal and bed clothing (mattress, etc.), by means of stoves which raise the heat to over 100 C.; by means of a prolonged boiling in water which contains some chemical disinfectant or other substance which will raise the boiling point (sub-carbonate of sodium) or in the last resort, the destruction of that clothing by fire.

C. All utensils, such as cuspidors, stools, etc., should be well washed with water, disinfected with some chemical substance, such as sulphate of copper, chlorid of calcium, etc., or passed over a flame.

D. The excreta should be carried off to the drain by an abundant current of water.

E. For the special advantage of the patient, his skin should be thoroughly cleansed by at least one bath, and his hair cut so as to do this better.

All the mucous membranes should be disinfected, as follows:

I. The mouth and larnyx, with swabs which carry energetic substances, such as iodine, resorcin, etc.

II. The eyes, the outer channels of the ear, the nostrils, with boracic acid or cyanide of mercury in a dilute solution (0.20 per 1000).

III. An abundant washing of the intestines made with a catheter and with one, two or even more litres of sterilized water or physiological serum.

F. We have no clear proof that the scales which frequently appear during convalesence are a danger to others; but nevertheless, as a precautionary measure, the patient should be made to take frequent baths until the scales disappear.

In closing, I must say that, for the reason that we do not know the pathogenic agent, there is no reason for applying the resources which are injurious to the patient, on the pretext that they are curative or prophylactic, as by observing carefully the measures above explained, we obtain as good a defense as possible, against an enemy who is unknown.

RELATIONS BETWEEN THE SANITARY AND POLITICO-ADMINISTRATIVE AUTHORITIES IN THE MEXICAN REPUBLIC.*

By Dr. DOMINGO ORVANANOS,
Mexico City, Mexico.

The subject I am about to treat of is of the greatest importance, but nevertheless, I will deal with it briefly and from a strictly practical point of view.

During the first half of the last century, the Supreme Board of Health of Mexico was simply an advisory body. It watched over the practice of Medicine and of Pharmacy, and saw to it, that the practitioners held the necessary diplomas; it inspected the Pharmacies to ascertain that the drugs employed were pure and that prescriptions were properly made up, and it also suggested the measures to be adopted in the great epidemics as happened in the years 1833 and 1850.

From the middle of last century to 1877, little progress was made as regards public health, but all the town councils of the Republic appointed Committees which were specially charged with matters of public health, and these suggested to the corporations, the measures which ought to be adopted for improving the health of the towns. In the year 1877, the Board of Health commenced the formation of a Sanitary Code; the members which composed this body made visits to this country and to different European cities, and lastly, the formation of the Code was completed and it was promulgated in the year 1891.

Before the promulgation of the Code, the relations between the Sanitary and Politico-administrative authorities were those of the most complete subordination. Subsequently, through the spirit of the provisions enacted and the fact that the Board had received powers of a Federal character as regards the Ports and frontiers, the relations with the administrative authorities, had to suffer some change. The Delegates of the Board in the Ports and frontiers remained in charge of Maritime Sanitary

* Read before the American Public Health Association at Richmond, October, 1909.

matters as well as those under Federal jurisdiction, but had nothing to do with the local Boards of Health, which had full charge of the local Sanitary Police, according to the legislation of each State; but, as was to be expected, differences then began to arise between the sanitary authorities and the others.

The obligation which is incumbent on all medical practitioners and local authorities to notify the Delegates of the Board or its representatives, of the persons who are suffering from small-pox, diphtheria, cholera, bubonic plague, yellow fever, or any other disease which is classified as dangerous by the Executive of the Union; the prophylactic measures adopted for the purpose of preventing the propagation of those diseases; the establishment of sanitary stations, in or near those of the railroads, so as to be able to inspect passengers, baggage and goods arriving from any contaminated place, and other similar measures, could not do less than create such difficulties at first that at times they appeared insuperable.

The principal difficulties which arose can be divided into four classes, as follows: Firstly, difficulties between the local Board of Health and the Delegate or Representative of the Supreme Board of Health; secondly, those which arose between two different States, in connection with some sanitary measure; thirdly those which arose between the State Boards of Health or Governments and the Supreme Board of Health, and fourthly, those which arose between the last named Board and the Department of the interior, to which this Board is subordinated.

The difficulties of the first class have been settled by means of learned and influential persons of the localities or else by the Governors of the States or through special Delegates, who were men of sufficient energy, intelligence and prudence. On some occasions it has been found necessary to remove the Delegate of of the Board to some other Port, or else to employ influence to have that Delegate appointed to form part of the local Board of Health. The question of the expenses which necessarily have to be incurred on certain occasions, has been one of the principal obstacles to the realization of certain measures, and then the Federal Government has given ample assistance to the local administration, either by furnishing the half of the expenses or else by executing the work at its own expense. This is how the

necessary sanitation has been carried out on the Isthmus of Tehuantepec, the cities of Veracruz, Merida, Mazatlan and others. In these cities the Federal Government has largely assisted in the maintenance of the sanitary brigade, as well as in the execution of drainage, paving works, and the supply of good drinking water.

The difficulties of the second class have at times been almost insuperable; and in fact, as fear is a very bad counsellor as well as a tyrant who demands the most implicit and immediate obedience, it has on several occasions happened, that in the exercise of its sovereignty, a State has imposed an arbitrary quarantine against an adjoining State, and it has been necessary for the Supreme Board of Health, acting through special delegates and after a very hard struggle, to convince the State which had adopted quarantine measures that, without any such steps and by accepting those proposed by the Board, it could obtain the necessary security for the health and lives of its inhabitants.

As these cases have been repeated in connection with different epidemics of smallpox and yellow fever as well as with the epidemic of bubonic plague in Mazatlan, and the States have seen the confidence and certainty which the Board of Health has in its decisions, they have now acquired such faith in the good judgment of the orders issued by the Board, and more especially by the President, Dr. Liceaga, that to tell the truth, there are at present no difficulties of this character to be overcome.

The same thing may be said with respect to the difficulties of the third class. The Governments of all the States in the Republic have now the most implicit confidence in the Federal sanitary authorities, and willingly accept any suggestion which may emanate from that body.

The difficulties of the fourth class, are very serious, because as we have already stated, the Federal sanitary authorities depend on the Department of the Interior. This Department bears the responsibility for the results of the sanitary measures which are proposed by the Board of Health; it is that which asks for the necessary appropriations as the occasion arises, and it is the one which finally orders the execution of the plans proposed by the Board, even in urgent cases, and from what has been above said, it cannot take such prompt action as could be desired, so that it is

sometimes necessary to hold long conferences in order to induce that Department to adopt different measures which require immediate action.

In my opinion, these obstacles and delays cannot be overcome except by the creation of a special Department of Health. All the authorities in the Republic as well as private citizens in general, are prepared to see a Department of Public Health established, and I am convinced that the creation of such a Department, would work to the greater development, security and efficiency of all sanitary measures.

SOME FACTS INDICATING THAT MALARIA MAY BE SPREAD THROUGH OTHER AGENCIES THAN THE ANOPHELES MOSQUITO.*

By Dr. JESUS CHICO,
Guanajuato, Mexico.

In Guanajuato, Mexico, my native town, where I have spent more than thirty years of my professional life, malaria is one of the more frequent complaints met with. Though sometimes of a serious and even of a decidedly pernicious nature, it is generally mild and it is more dreaded on account of the weakness it brings along and leaves behind, predisposing the system to the attacks of other diseases, than on account of its own nature.

It has been identified in every possible way. Generally diagnosed by its clinical features, the bacteriological diagnosis is frequently resorted to in doubtful cases and Laveran's plasmodiæ have been found many times in the blood of the patient. So their presence in Guanajuato and its neighborhood is an unquestioned fact. NO LESS UNQUESTIONED IS ANOTHER, THOUGH NEGATIVE, FACT: "THE ABSENCE OF THE ANOPHELES."

I believe myself justified in stating that no prospector has looked for gold and silver in the mountains among which Guanajuato has been built with the same ardor and perseverance with which the anopheles has been looked for by the local scientists. But while the labor employed in the search for gold has been rewarded by many a finding, that spent in search of the anopheles has been, on the contrary, always fruitless. Everybody knows how easy it is to tell the anopheles from the mosquitoes of another genus and that one has no need of being a thorough expert to be able to discriminate between culex and that frequently mentioned genus. Besides, we chance to have among us since 1850 a world famed naturalist, Dr. Alfred Dugès, Professor of Natural History in the College of the State of Guanajuato, who, by the bye, is a son of Dr. Dugès, the man who coined for the use of scientists the word "obstetrics." With such an

* Read before the American Public Health Association at Richmond, Va., Oct., 1909.

authority as Dr. Dugès I feel sure when I state for the last time that "though in Guanajuato in the state at large, not only in the capital, there is plenty of malaria, no anopheles are to be found."

Up to 1888 we were quite free from any kind of mosquitoes; nevertheless, malaria was always present.

In 1885 a cargo of bananas from the coast of the State of Vera Cruz was taken by rail to the City of Mexico. Along with it a colony of myriads of mosquitoes of the genus culex invaded the city where, up to that time, there had been the same freedom from such a plague as in Guanajuato. Those mosquitoes took three years to get to Guanajuato where they arrived, as stated, in 1888.

It is natural to think that if the anopheles is able to suck malarial germs from a patient and inject them into the vessels of a healthy person a culex can possibly do the same thing. If so, the arrival of the culex should have been followed by an increase of the number of the cases of malarial diseases. Such was far from being the case.

When I began to practice, I inquired from the senior physicians of Guanajuato about local conditions of many ailments, malarial complaints especially. I heard from them that the more frequent ailments of this kind were intermittent fevers and neuralgias, nearly always of a mild form, yielding to a few doses of ten grains (0.60 grm.) of sulphate of quinine, and that serious or pernicious cases were due to individual conditions rather than to severe forms of the disease. My own experience confirmed what I had been told, and up to 1882 there was no change.

In this year, however, we began to notice that malaria had increased both in seriousness and frequency. Those few doses of ten grains of sulphate of quinine which formerly were enough to conquer paludical complaints were no longer sufficient and not only was it necessary to make a substantial increase of the doses but we had to alter the way of administration, recurring to hypodermical injections. So, malarial diseases ceased to be regarded as light ailments easily disposed of and became a dreaded scourge.

As I have already stated, the arrival of the culex mosquitoes did not make matters worse. The climax had been attained long before. It is true that nobody thought about the possibility

of a connection between those insects and malarial complaints: but we are quite sure that long before their invasion they had ceased to increase. As soon as we heard from the relation between the anopheles and malaria those among us which were able to make bacteriological investigations, looked for malarial germs in the proboscis of the culex, thinking that if the anopheles could inoculate malaria there was no reason to believe that the culex could not do the same thing. At the same time practitioners began to pay attention to the presence or absence of culices in the houses of malaria stricken patients and to observe carefully if those around the patients had been preyed upon by those mosquitoes and with what results. Nothing positive was arrived at; neither were the malarial germs observed in the culex nor have the practitioners ever found a case where a malaria patient in a house swarming with culices has become a focus of this disease, though, in cases out of number the worst imaginable conditions have been present; viz., a malaria patient, a swarm of mosquitoes, and the patient and those who attended him covered with the nettle-rash like eruption caused by those insects.

Among those who have looked for malarial germs in the culices I ought to mention Dr. Antonio Herrera and, principally, Dr. Jesus Aleman. Every practitioner, since it was known that anopheles could transmit malaria, has paid a close attention to the surroundings of the patients on the outlook for anything that could show the possibility of the culex doing the same. So, I believe I represent the unanimous opinion of the physicians of the State of Guanajuato when I state: 1st. That malaria in all its forms, exists in the state. 2nd. That it has existed before the arrival of the culices, the only mosquitoes which, up to this time, are to be found in the State. 3d. That, as implicitly stated in the seccnd proposition, there are no anopheles in Guanajuato. 4th. That no relation has been found between malaria and culices.

Until now I have confined myself to the statement of facts, both positive and negative, keeping clear of any theory, and I still confine myself to facts in what I am now about to state:

As I have said before ,up to 1882 malaria was mild in its manifestations and not frequent in its occurrence. Since that date things have altered and malaria has become more frequent and of a more serious nature. If sanitary conditions in the towns

of the State had changed for the worse it would be idle to look for another cause but this one; as it is quite the contrary and those conditions have been uniformly bettered it is logical to look for another explanation and there is one at hand which suggests itself at first thought.

You all know that the Mexican territory is an immense table land flanked by two narrow strips of coast and that on account of its altitude above sea level that table land, though within the tropics, is practically not tropical. Formerly, that is, before 1882, for the State of Guanajuato, communication with the coast, where the climate is decidedly tropical, was slow to a degree. The most rapid way was the stage-coach, which, on account of its five miles an hour speed, in the dry season, was called "diligencia." It required a week to get from Guanajuato to the nearest point of the coast. If it was during the rainy season, only God knew how many days would be required for that same trip. Goods took at least one month to arrive from the coast. Now an average of thirty hours is the time needed for it.

Few commodities of those produced in the coast are taken to the table land: sugar, brandy, hides, fine kinds of wood and fruits are the only ones beside tobacco. They require only an average of four days to get to Guanajuato and the neighboring places by rail. Railroads have brought nearer to one another the coast and the highlands, and malaria has increased apace with the railroad net. 1882, the year when malaria began to change for the worse, is the year in which the State of Guanajuato was tapped by the railroads.

As I have told, the sanitary conditions of the towns, instead of getting worse, had changed for the better and the only change which could account for the increase of malaria is the increased rapidity of communication with the coast where the climatic conditions are decidedly tropical and where the most dangerous breeding grounds of malaria are to be found.

The most careful observation has failed to show anything that could make believe that people coming from the coast had been the means of spreading the disease. If such had been the case the increase would have been found among persons who had returned from a trip to the seaboard and among people living in close contact with them; but nothing like this has been observed.

By far the greatest number of those attacked by malaria have had nothing to do with persons who had gone to the coast; so the cause must lie in another direction, not in the passengers but in the goods which come from the places where malaria is both frequent and of a dangerous nature.

I have mentioned tobacco, brandy, sugar and molasses, hides, fine woods and fruits, as the only goods which are sent from the coast to the highlands. It is not to be thought of that the six first named commodities can act as a vehicle of the disease; only the last one can be considered in that line. Popular opinion uniformly accuses the fruits of being the cause of malaria in its worse aspects and people who go to Tierra Caliente ("warm land") as the coast is colloquially named among us, assert that if they keep clear of fruits and add brandy to the water they may remain free of malaria.

Up to this time the search for malaria germs in fruits has yielded but negative results; but you all know well how difficult are investigations of this kind. I am in close touch with ardent investigators who, undaunted by the fruitlessness of their task, will continue it until they have found something positive or when fully satisfied that vox populi has erred once more and fruits are not to be blamed for the spread of malaria.

One thing, I think, remains: "The anopheles is not the only vehicle for the spread of malarial diseases."

AN INVESTIGATION OF THE EXTENT OF THE BACTERIAL POLLUTION OF THE ATMOSPHERE BY MOUTH-SPRAY.*

By C.-E. A. WINSLOW and E. A. ROBINSON,
From the Biological Laboratories of the Massachusetts Institute of Technology.

(ABSTRACT.)

Flügge and his pupils have laid stress upon the spray thrown out from the mouth in coughing, sneezing and loud speaking as a possible factor in the spread of tuberculosis and other respiratory diseases; and some sanitarians have made this work the basis for far-reaching theories of the importance of aerial infection. The present investigation is an attempt to measure the quantitative importance of this possible mode of disseminating disease.

Most of the German experiments were made by inoculating the mouth with *B. prodigiosus* and exposing plates at various distances from the subject, who coughed, sneezed or spoke loudly. In repeating these experiments with loud speaking only, we found, as the Germans have done, colonies of the specific germ on plates 7.5 meters away though the maximum numbers were at a distance of 2.5 meters. The average number of *B. prodigiosus* colonies found in front of the speaker after 15 minutes loud speaking in a room 8 meters long was 646 per square meter of surface. Most of this pollution was, however, in the form of coarse spray falling through the air rather than suspended in it. Quantitative examination of the air itself immediately after the period of speaking showed only seven colonies of *B. prodigiosus* in 140 litres of air.

In all such work as this, conditions are somewhat artificial since the liquid introduced artificially into the mouth may probably be ejected more freely than a normal secretion. Gordon has suggested that the mouth streptococcus might be used as an index of mouth pollution under more typical conditions. Some final tests were therefor directed to this question. Air was collected from points between 35 cm. and 2.4 meters in front of the

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subject who spoke loudly with vigorous enunciation. Out of 74 liters of air examined not one showed mouth streptococci, although these organisms could be found, as in the previous case, on plates exposed in front of the speaker.

It appears from these investigations that spray is discharged from the mouth during loud speaking in such amount as to cause a considerable pollution of exposed surfaces upon which it falls. True aerial pollution by particles suspended in the air and liable to be inhaled with it, is on the other hand so slight that it can hardly play a relatively important part in the causation of disease.

DISCUSSION.

Dr. WM. A. EVANS, Chicago: I am quite in accord with Dr. Winslow as to a portion of his views, and I do not agree with him in a portion.

In my judgment he is right as to the danger from infection through air in the proximity of people bearing certain infections.

The breathing zone is the place of maximum importance. Our great efforts of every kind must be to keep it pure. It is of the first importance both in air borne infections and in those slow acting intoxications resulting from chemical and physical changes in the air. Those portions of a room which are not to become breathing zones are better for being left as unventilated areas, since thus they become settling areas for purifying air of its bacteria and its dust.

Prof. Winslow has applied the quantitative method to the bacterial content and argues from such study that air is relatively harmless. Let us see how it figures out. He tells us of 7 bacteria in 140 litres of air. That is one bacterium to 20 litres of air. If this is an average of the bacterial content of the air breathed we find that a man will inhale in a life time 14,600,000 bacteria. Now, let us take any one of these air borne diseases, or two, say, tuberculosis and pneumonia. What is the percentage of these in air to other forms of bacterial life? It would be bootless to attempt to determine.

But, eliminating, now, the periods and places of safety, and speaking of the periods and places of danger. What is the percentage of tubercle bacilli and pneumococci to the total bacterial content of the air within three feet of a carrier sick of the first infection mentioned, or sick or well of the second? How often in a life time of seventy years will a man come within three feet of any such carrier? As one inhalation under proper circumstances will determine infection, the quantitative method proves the danger and not the safety of air.

We do not expect a man to get a new infection with an air borne disease with each inspiration. If he is properly careful he may take sixteen inspirations each minute for seventy years and not get any of them. But security must come from proper

precautions based on a reasonable fear and not on a seeming security. So much for the immediate effects of infected air.

The indirect effects of dirty or impure air are just as logical. Some parts are well proven, as for example, that trades which are carried on in an air filled with inorganic dust pay heavy toll to consumption; that people working in foul air are sleepy, logy, stupid, and eventually anemic. Other parts have not yet been demonstrated. In this air follows the rule—is not an exception. Typhoid bacilli in a great, general water supply have never been demonstrated by cultural methods. Tubercle bacilli in a mixed milk supply by cultural or microscopic methods are usually unprovable. Cultural methods for tetanus in fire crackers are negative. But that fire crackers cause tetanus, milk tuberculosis and water typhoid is accepted.

While we wait for demonstrations let us stand on the common sense ground that dirty air is no less harmful than dirty water or dirty food. Probably it is much more so.

THE SANITARY REQUIREMENTS OF VENTILATION.*

By Dr. W. A. EVANS,
Chicago, Illinois.

(ABSTRACT.)†

The agencies responsible for the harmfulness of bad air are: (1) bacteria; (2) dust; (3) temperature; (4) humidity; (5) odors; (6) CO; (7) organic matters; (8) CO_2. Some of these do and others do not follow the laws governing the diffusion and dilution of gases, and the laws of physics governing the movements of air currents.

The author states the following principles to govern ventilation:

(1) Attention must be concentrated on the breathing zones of the habitually occupied portions of the room.

(2) In this zone there must be the greatest possible effort to prevent (a) stagnation, and (b) dilution.

(3) Dead zones and corner eddies must be encouraged as settling places for bacteria. Such spaces must be unoccupied and must be cleaned daily by moist methods.

(4) The breathing zone must be occupied by an even up-current of air, moving at the rate of at least 60 feet a minute from multiple floor inlets to multiple ceiling inlets.

(5) The ventilating air in mechanical systems should never enter the room at more than 40 degrees below body temperature; 30 degrees below is better still.

(6) The air must be protected from dust.

(7) It is of great importance that the relative humidity of the inside air should not be materially greater than that of the outside air. It is of some importance that it should not be more than two degrees less than the outside air.

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† Published in full in the "Medical Record," May 21, 1910, Vol. 77, p. 870.

(8) The volume of air per quiet person per hour should be around 500 cubic feet, varying with the directness of removal of the polluted air.

(9) The arrangement of the ventilation must be such that the windows can be opened and the room blown out at least once in each 24 hours.

(10) Recirculation of air is not to be tolerated.

(11) The air must be below 6 parts per 10,000 in CO_2, and low in dust and bacterial content.

PRESIDENT'S ADDRESS.

THE SANITARY EDUCATION OF THE PEOPLE.*

By GARDNER T. SWARTS, M. D.,
Secretary State Board of Health, Providence, R. I.

One of the objects of this association is "the development and advancement of public hygiene" for the conservation of the public health. The means by which it has been thought to accomplish this object have been various.

The demand for such an association has been the result of the advancement of man in his corporeal development. In his desire for increased comfort and enjoyment in living he has advanced to a condition which has been termed civilization. But in his rapid and progressive betterment he has been drawn away from nature in her normal intentions and in her demands for primitive conditions. With all the scientific advancement and knowledge man has overstepped his sense of comfort to the point of luxury and degeneracy. It has been the effort and intent of this association to ascertain the reasons for this degeneracy and to offer means to place man in correct relation with nature's laws to conserve life and with it the comfort and happiness intended for his being. We have endeavored to teach what we have learned but much that was seemingly true yesterday is but the pricked balloon of today.

It must be realized that it is doubly difficult to unlearn and then to acquire new beliefs; a habit is not easily changed. Fortunately the respect for medical science and its teachings has not been overthrown by the overzealous faddists nor by the new and strange medical and sanitary novelties taken on with a quasi-religious motive. It is also to be noted that at the present day the loud declamation of the untried investigator receives no confidence. The quiet, steady working laboratory man who

* Read before the American Public Health Association in Richmond, Va., October, 1909.

speaks not until he has doubly reassured himself receives careful attention and respect.

Although we may be familiar with the works and names of our best research men we may not be able to utilize the knowledge given unless we as sanitarians can apply this knowledge.

Fortunately before this degeneracy has reached its limit, man has profited by the unfortunate experience of preceding generations and has grappled with the question of supremacy over the conditions which have brought this about. Being stimulated by suffering and loss of life an intelligent effort has been made to ascertain the causation and to apply a remedy. The rapid advancement and encouragement of scientific investigation has placed the present generation in an advantageous position. The change from the teachings and ignorance of only a few years ago is startling. It is not beyond the memory of those now living that the humoral theory as a cause of disease gave way to that of cell theory and that in turn to the presence of the bacterium as a factor. No longer do we teach that which we so firmly believed that sewer gas and decaying garbage were a cause of specific epidemic diseases; that the presence of either might cause typhoid fever or malaria. But many of our oft repeated mistaken assertions were fostered and garnered by the public, and it is with much difficulty that we can reconcile them to the fallacy of such knowledge and to accept the belief that the transmission of malaria from one person to another may be possible through the mosquito or that flies may be carriers of infection of typhoid fever or tuberculosis.

Almost daily the research laboratory gives to the working sanitarian some new encouragement, some new understanding of cause and effect, some new method of combating or preventing the parasitic inroads of different diseases. But yesterday we were informed of the causative factor of tuberculosis, the conditions under which that factor existed, its means of extension and what means might be utilized to destroy it. So firmly had this disease established itself that the world had become resigned to its demand for victims and it has been a difficult matter to awaken it from this lethargy, but with the enthusiasm aroused by the few earnest workers for the betterment of man's conditions, sociologists, endeavorers and sanitary authorities are vying with each

other in some sections and combining with one another for a common fight against this plague which claims more victims than any other disease.

To utilize the value acquired by a campaign of education it became necessary to remove the ignorance implanted for ages and to enlighten one and all as to the meaning of this scourge. This movement has grown to vast proportions and is daily spreading to every state, county and hamlet. The National Society for the Prevention of Tuberculosis has sent its agents into every part of the country as far as its funds would admit. It has taught the local authorities and zealous philanthropists how to go to work to extend the education necessary to reach everyone. Its work has been carried from the larger communities to the innermost sections of the South and West. How much planning, organizing, direction and ingenuity is required to reach different classes is known only to the steadily worked officials conducting the campaign. How best to approach the different classes with their varied prejudices and the different national dispositions; to overcome the apathy of discouraged communities accepting as God's will the afflictions from which they were suffering has called for a specialized corps of minds to spread the knowledge of "how to avoid getting consumption and how to avoid giving it to others."

When we realize that where only a few state and local leagues for the suppression of tuberculosis existed a few years ago we may now number the hundreds, when four millions of dollars are placed in the hands of the crusaders against this disease in a single year for care and treatment and many hundreds of thousands of dollars for educational movements alone, we can perceive what may be done when education is undertaken from a business standpoint. While it is admitted that the subject was one which appealed to every community, every family and every individual, yet it was first necessary to educate the prime movers at first hand by showing them the need of action.

What has been done in this crusade can be done with other problems which confront us as sanitarians. If these methods have proved successful they should be utilized. It may be feared that the system will be overworked. Has the system of instilling into the minds of the public that a certain three dollar shoe was

the best to be worn, or that the Stringling circus bearing the imprint of one of the most popular educators in amusement, been overworked? Our appeals for assistance are to those and for those who are to be directly benefited. It is necessary to force this assistance upon them in some way and the best way is by co-operation.

That the work of this association may bear fruit attention must be given to the steady advancement of sociology from its sanitary aspect. The societies interested in this work have been organized and conducted on business lines by business men. Their work is not theoretical alone but they find a way of applying their knowledge in a practical way, looking for results which can be shown. While we have no working force for the application of our work yet by co-operation and a close study of the methods of the sociologists we could be a means of benefit to them and would in this way untilize the practical scientific deductions made at our meetings. We should advertise our work. The enemies of health and sanitation utilize every means for bringing their nostrums and germicides to the attention of the people and they sell their goods. When the homely rugged features of age are exploited in connection with Duffy's Malt Whisky and the buxom patrons of Lydia Pinkham's Compounds attract the eye at every hand, we must believe that the word of these must have been taken for some worth or the cost of advertisement could not be met. Let the people know at close hand the value of a knowledge of practical sanitation. Utilize the press for its daily presentation of aphorisms and frequent short articles on health matters accompanied by the official stamp of the board of health. The reaching power of these papers is enormous when compared with the circulation of our monthly bulletins. This is now being done in some of the states to advantage. That money will come to those who show their worth is demonstrated in the direct movement against tuberculosis.

The association should have a paid publishing committee and a regular publication of its own. It should issue circulars and reprints for distribution where they would be of use. It is true we have a fine quarterly display of our papers and a committee is to report on the feasibility of assistance in the form of voluntary philanthropic contributions. Other societies and associations

have their publications on a paying basis. Several sanitary journals have gone to the wall but this association, with its prestige and the character of its membership, should be able to let everyone know that it is the field for applied work. It is desirable and necessary that we reach every class of the people. The work of reading papers and discussions are confined within our own walls. True we have the compilation of our transactions issued in book form. These are placed on the shelves of various boards of health, of the members and of the various libraries for reference. Our deductions and conclusions are not spread broadcast among those who should be benefited.

Those of us who may have visited the International Tuberculosis Exhibit at Washington, New York and Philadelphia were attracted by the raucous tones of the phonograph delivering its message of warning. While we may have been irritated at its penetrating and demanding noise and the extremely plain language which it uttered, yet we stopped and listened from curiosity. Others did the same and many were caused to think again what that vast exhibit meant to themselves, their families and the people. It may appear unethical and undignified for a scientific body or a board of health to indulge in circus demonstrations to accomplish their work. It may seem to some of the older school that the periodical explosion of bombs every five minutes, as is done in the City of St. Louis to attract a crowd in the congested district to attend a lecture on tuberculosis, is going a step too far. Perhaps some of the gruesome cartoons issued by zealous societies may depress the public more than they stimulate but if we are to reach the people we must go among them, be with them and adopt methods which must attract them in an age when so many startling features are presented in various ways.

We must bend our dignity and if the literature issued is unintelligible to the members of the labor unions because it does not bear the stamp of the union label, we should not demur that the demand is unjustified when we are seeking the good of the people but supply any amount of diamond shaped imprints on the front and back of our circulars; only reach them. If you are addressing a Polish audience do not attempt to make them understand the English language. It is not the scientist alone whom we are

seeking to interest in our sanitary campaign, it is the people and the worst conditions are to be found where it is hardest to reach.

When the registrar of vital statistics sees the cause of his largest figures firmly attacked, as in tuberculosis, he gives heed to the other most prominent causes of death. Among these he finds infant mortality swelling his tables, a mortality which we as sanitarians know is a preventable one. That so many children should die as the result of ignorance of the simplest dietetics betokens a selfishness or negligence on the part of those who do know better. Much of the work of carrying the instruction to those in need of it has been done by social workers, through district nursing associations, one of the most influential and workable agencies, accepted with gratitude and appreciation by the health officer, the philanthropist and the benefited alike. State and municipal health departments are coming into line. The practice of sending to the parents of every new born child, recorded by the report of the birth of the physician, a circular on the care of infants has been adopted by some of our health officers.

Assurance has been necessary on the part of such officers lest they offend the properly assumed prerogative of the super-ethical attending physician in his advice to his patients. This bugaboo has been one which has stood in the way of much needed control of preventable diseases. But did the attending physician in these cases know more about the care of infants; if he was taught more about infant feeding in his medical course, if he had contact with the family for a longer period than the three visits following confinement there might be excuse for complaint of what is termed interference of the health department, in fact there might not be any need of its attention. Of these neglected qualities on the part of the physician the writer as a health officer and as a registrar speaks advisedly. For a correction of this evil of unwarrantable deaths under the age of five a movement has already taken root to specialize in this particular line of prevention. During the coming month a conference on the Prevention of Infant Mortality under the auspices of the American Academy of Medicine will convene at New Haven and the comprehensive programme presented for this its first meeting should receive the attention of every member of this association for it is doing work which this

association should do and to which it should lend co-operation as far as may be possible.

In order that the masses may receive the value of our work, education in sanitation should be undertaken in every line. The character of the teaching in hygiene in public and private schools has not been of a character that would leave an impression in the mind as to the importance of the subject. Some of the lessons forced into the pages by the editors under the pressure of uninformed enthusiasts teaching against alcohol and tobacco have caused doubt in the youthful mind, bringing discredit on the rest of the teachings in their little sanitary primers. More attention is being given to the education of the teachers having charge of these young minds which are to be a strong influence in moulding future sanitary control. The value of practical knowledge given by the public school teacher in this way is distinctly shown in the effect upon the minds of our young aliens. "Dear teacher's" word is gospel and they carry her word to the home. Here, from their knowledge of our language and from their alertness, the little mothers become strong mentors to their elders who listen intently to their admonitions and ofttimes endeavor to live up to our ideas of cleanliness and hygienic living. It is well, therefore, that the instruction given to the teachers of these little teachers shall be of a character which is applicable to everyday life.

Examining boards should issue to each applicant who receives a certificate to practice medicine a set of regulations by which he should be governed in connection with the public welfare, indicating his duty in co-operation with the department of medical jurisprudence, the general sanitary laws of the state and advice to become familiar with the local sanitary ordinances of the city or town in which he intends to locate. The beginning practitioner is not always acquainted with the practice of sanitary laws, nor can he be expected to know the requirements of the state laws and local ordinances governing the control of communicable diseases. The lack of education in the medical curriculum is constantly shown in the examination for medical practice. The number of hours given to the subjects of hygiene and sanitation are merely perfunctory. The student is given an idea that but a little knowledge of the kind is adequate. The public, becoming

acquainted with the principles of prevention, soon recognizes the young practitioner's shortcomings and he suffers in their estimation proportionately.

The Council of Medical Education of the American Medical Association has recognized the needs of the requirement of a certain minimum number of hours to be devoted to these subjects and the medical schools in good standing are offering better opportunities. Yet one school, in fact the one which has set the standard for higher medical education, offers no facilities to its students for the study of the common communicable diseases, most of the graduates having never seen a case of scarlet fever or measles. How are we to expect them to report cases of exanthematous diseases when they are unable to recognize them except by the assistance of parents who have had the experience attendant upon a large family of children?

CONSERVATION.

When it is proposed that our association co-operate in the general conservation movement our first thought may be that we have little to do with the preservation of forests and the greed of the lumbermen. Except for the production of heat for health we would not at first sight see our relation to this most important movement, but then we recollect that if it were not for the retention of the rainfall by forest growth our water sheds would be barren plains or scarred by intermittent torrents and that our water supplies would fail.

Yet this term conservation has broadened out to include many interests. The preservation of one factor in our life cycle is necessary for the perfection of others. With increased products of the soil we may look for a more liberal sustenance for man and beast. If the health, wealth and power of mind of our civilization is dependent upon the agricultural status then we should be interested for its betterment. The conservation of life, the purpose of our association, is dependent upon all these influences and every encouragement and assistance this body may be able to present should be given freely to those who have taken up this new public movement.

VITAL STATISTICS.

That we may know the prevailing causes of death, especially those which we may be able to control, it is necessary that correct returns as to the cause of death be given. Not only should the number of deaths include each and every death but the actual cause of the death must be as absolutely correct as the ability of the diagnostician who attends the case permits.

This requires not only care and willingness to perform this final duty which the practitioner owes to his patient, his family and to the common welfare, but it also supplies the correct knowledge desired by the compiler of vital statistics to enable him to properly classify the causes of death. To report as a cause of death such symptoms as dropsy, inanition, heart failure or hemorrhage does not give the statistician the information necessary to determine what pathological conditions existed and which produced these several conditions.

In those states which have had registration for many years these mistakes occur less seldom, but in a new registration area a vast amount of education is required to make the physician understand that the registrar is not a mind reader or a telepathic medium. This education is becoming less necessary. Younger medical graduates early get into harness, for the relation of cause and effect are brought out more emphatically by the instruction of the present day. From the older practitioners an increased amount of information has been revived by the registrars as the result of the comprehensive aggressive and reiterated efforts of the Chief of the Vital Statistics Section of the United States Census Bureau. This education of the practitioner must be followed by the ceaseless requests of the local registrar for more complete information as to cause of death when known.

Yet another class of workers in the line of sanitation are in need of education to the end of more complete vital statistics. If the time and energy expended upon undertakers by our sanitary meetings in urging the requirements of quasi-scientific procedures in transportation of the dead could be utilized to instruct them in the needs of securing a correct and prompt return of a death, greater value would accrue to the cause of sanitation.

This calls for continuous education on the part of the state registrar of vital statistics.

This association has already shown its dependency upon this line of work by apportioning its time and authority to a section which has shown the vast amount of work being done to assist the general sanitarian. It should foster and support all federal efforts to make the United States a solid registration area.

AFFILIATION WITH OTHER SOCIETIES.

The American Public Health Association was organized in 1873 and since that time it has maintained a high standard of scientific attainment and dignity. Its organization has been slow to change but at the present time with three separate sections dealing with the practical aims of the association detail, leaving the general session to discuss subjects more general, we have a strong working force for the purpose of the betterment of the people as well as for the assistance of sanitary workers.

Other associations, conferences and committees, working along similar lines, are in the field. The association has invited other groups of sanitary workers to join their forces with us and we are in turn invited to amalgamate or at least co-operate with the division of another large association. I can see no gain to come from affiliation between any of these for the purpose of advancement of any single one.

The Conference of State and Provincial Boards of Health has its lines laid down for the consideration of immediate application of health laws by officers of states for the executive part of the whole scheme. The Section on Preventive Medicine and Public Health of the American Medical Association has the consideration of the same subjects as this association but from a medical standpoint. It should be a still stronger factor than it is in teaching the medical man much which he wishes to know of the relation of his medical work to the rapidly growing experience of the authorities in hygiene.

FEDERAL SUPERVISION.

The position of this association in the interests of the formation of a federal sanitary control should be fully discussed and its desires distinctly promulgated. The efforts of new and active promoters of a National Board of Health should be supported so

far only as the experience of this association warrants. I believe that an amalgamation of the various scientific divisions of the federal departments under one head or bureau would receive more active and successful support than the establishment of a National Board of Health. This should not call for the extinction of any division now existing but the work done by these departments which may have a bearing on sanitary knowledge and control should be utilized under one common director.

Such a bureau should have complete control of interstate sanitary questions including the use of streams for sanitary as well as unsanitary uses and of the transmission of communicable diseases by transportation and of immigration. It should also have the power to enter any state for the purpose of study and investigation for the benefit of all other states when such invasion of state might seem necessary. If such a bureau could not constitutionally have the right to control any unsanitary conditions which might menace a neighboring state it could be given the right to quarantine its borders. States which have heretofore antagonized federal attention on sanitary matters are now requesting assistance, their myopic vision being cleared by experience and by the demands of the authorities represented in this association.

The tendency of certain legislation recently passed and more to follow is fortunately leading in this direction.

NEW PROBLEMS.

The interest of the several states may be concentrated on their own difficulties and, although we meet yearly and sympathize with our neighbor's neighbor, yet we do not have, perhaps, the whole-souled interest that we should have if we feared that certain diseases were liable to immigration into our own state. We of the North may not have listened as attentively to the anxieties and sad experiences of the Gulf States with yellow fever. We have expressed our sympathy and offered our consolation. The hook worm disease excites our curiosity and a demand that urgent measures should be used to stamp it out for the cause of humanity. The question of plague aroused us to a common defense to which the several states heartily rallied and the unpleasant demands made at that time have served to the better-

ment of the locality at fault and have served to connect more closely the amalgamation of action and interests of our several state health authorities. Leprosy has been an annoyance to some of us and for the saving of expense and possible danger, and for the good of those afflicted with the disease, support should be given by this association to any movement which calls for the establishment of a convenient retreat for those who, if isolated in small colonies, will lead a life of dreariness. If assembled in a large colony they are in a position to exchange the sympathy which comes with a misfortune common to all so retreated and can receive more experienced care, relief and possible recovery.

With all our diligence and progress in the control of disease we are ever beset with some new difficulty. Recently there have arisen on our horizon two strangely obscure conditions which will tax our scientific investigation for its fullest worth. We may have listened with startled interest to the reports coming from the South that Pellagra was asserting itself with uncomfortable assurance and have wondered what sort of a Greek monster this might be but have believed that whatever it was it might not wander beyond the confines of the corn belt line or add to our sufficient troubles. From the Central West comes the warning to be prepared to meet with another problem, Epidemic Anterior Polyomyelitis. With the rapid development of this disease, its epidemic invasion of some of our states, we may well have cause to be stimulated with new enthusiasm to meet with and to study its puzzling conditions. The earnest workers in the territory chosen for its first appearance are already in the field using all of the latest means of investigation at command.

For the furtherance of our general protection it is advised that each department of health take immediate notice of each and every case appearing, noting the surroundings, influences, associations, locally and by lines of travel and food supplies and reporting these findings to one epidemiologist who may be working upon these lines and to whom such information would be of service. Here we have two diseases which should prove as a source of inspiration to an association of this kind to work together and seek out the conditions under which they exist with a uniformity of purpose instructing the clinicians to a sense of

alertness in diagnosis and supporting the epidemiologist with inspectors, laboratory research and reports of occurrence of the diseases in isolated as well as epidemic cases.

PROPHYLAXIS AND CONTROL OF THE VENEREAL EVIL.

When we consider the large amount of suffering and the number of deaths occurring as the result of infection from syphilis and gonorrhoea we may well be startled into a feeling that we are derelict in our duty as sanitarians. If the statistics presented by our hospitals and by our ever active gynecologists are correct that 70% of the laparotomies performed are necessitated as a result of infection of the female abdominal viscera with the gonococcus and if our studies show us that a large number of active strong constitutions are giving up life at an early age as the sequence of early syphilis infection, something must be amiss in our methods. Here we have two communicable preventable diseases and yet what are we doing about their prevention?

It has been shown by repeated trial that segregation and inspection of the infected is without beneficial result and perhaps pernicious unless the system is under strict military control. We have succeeded in teaching the people to beware of the dangers of smallpox, yellow fever and scarlet fever but how have we endeavored to educate them in the fear and caution necessary to avoid infection from these two diseases?

As a result of the meeting of the Conference of State and Provincial Boards of Health at Washington in 1904 three or four states undertook to distribute many thousands of circulars among the medical profession. These were so worded that the layman could understand the conditions which existed and were to be given to their patients when deemed advisable. This system lasted for a short time and, except in one or two states, has been discontinued. This method of reaching the individual who is a source of danger should be a means of assisting the sanitarian to meet with its active presence for a majority of these cases consult a physician during the activity of the disease. Those who do not should have received education in these matters before the chance of contamination existed.

An endeavor is made to accomplish this in the medical schools but the instruction usually comes four years too late.

The student should have been warned and been fully informed of his danger on the first day of entrance in his academic college career, but the mass of people does not have the privilege of a college education and unless informed of the danger will be a constant source for the spread of the disease and the increase of our morbidity and mortality statistics. The education of the people, as in all sanitary matters, must begin in the kindergarten and continued and repeated in all the grades of education and beyond the confines of the school room. By instruction concerning sexual relations along biological lines from the lowest school grades to the upper grades, leading gradually from the bioplasm and insect up to animals and man, simple every day facts are learned avoiding the sudden revelation of a mystery.

Owing to a false sense of modesty taught us by our ancestors it is a difficult matter to speak to an adult of these matters thus leaving them to be brought to attention under the dangers of secrecy. Such teachings as have been issued have been by the charlatan through alarming advertisements in the public press and by lectures, all of which has possibly many times led to suicide of conscientious young manhood for fear inculcated by these vampires who flaunt their vicious statements in the faces of prudish sanitarians. Symposia dealing with this plague were held on two different occasions by the Hygiene Section of the American Public Health Association. While much enthusiasm was awakened yet no future action was taken. It was felt that the education in sanitary regulations rested with the health officials and the pedagogues of social economy in our public schools and colleges. That labor which is shirked by each in turn remains undone

Let this association show its standing and its worth to the community by appointing a committee which shall do something more than make a report, that shall show the ways and means in combating these evils and be authorized to formulate a crusade which can be carried out by every agent at one and the same time. The individual who attempts to press these matters alone and unaided at the present status of puritanical criticism will be marked as one seeking notoriety and will fail, bringing ridicule on his attempt. Besides thorough and plain instruction in the upper school grades by instruction in a proper manner to the

public, even by suitable exhibitions which have already been inaugurated in our metropolis, a beginning can be made. The completion of the work rests with the gradual growth of method of instruction from early childhood. This cannot be brought about at once. It will require time and gradual enlightenment of those who are responsible for the courses of studies laid down for purposes of social and sanitary betterment.

Yet another class of persons suffer as a result of ignorance of the danger of these diseases. The innocent unprotected babe comes into this world without the means of protecting itself against its so-called civilized advancement. On the threshold of its life it may possibly meet with a handicap which may cause its life to be a barren existence, and as humanity demands that its life shall not be extinguished it becomes a burden upon the community because loss of sight prevents it from guiding the future footsteps and it becomes an expense to the state. Since we know of the cause of ophthalmia neonatorum; know that it is a communicable and preventable disease, can we not as sanitarians do our share in aiding the infant against this enforced imprisonment.

The American Medical Association has taken up this question. This may stimulate its individual members to a memory of what is taught them in their college courses. Unfortunate experience with children in their obstetrical practice may remind them. A few have had partial loss of their own eyesight in forgetfulness of this danger.

An attempt on the part of the medical profession to give instruction in hygiene has often been looked upon by the laity as bearing some ulterior motive. It remains for the department of health to seek out a means of bringing this knowledge to every age, creed and nationality. This can only be done by an open crusade. Already as in many other lines, political and social, the publications of the Ladies' Home Journal and Colliers' Weekly have endeavored to expose these dangers to its readers. These papers go to the homes; to the firesides of thousands of families. If these journals find it necessary to warn their readers against dangers medico-social can not we at least make some effort to fulfill our mission?

We are informed that at least 25% of all the children in public blind asylums have lost their sight as the result of the invasion of a specific organism. The inspection of the eyes at birth or soon after is not recognized as being of especial importance by the child's attendants. The advice given by the ignorant midwife or the kindly motherly person whose self-imposed duty is to care for all of her neighbors is to wash the eyes with breast milk, or the hasty physician orders that the eyes be washed out with a dilute solution of borax, and in a few days the eyes of the infant are gone beyond recovery. In many cases no physician is in attendance. In most cases the physician does not see the case after the fifth day from birth. How are we to reach the understanding of those who are in need of this knowledge? They are not all in the poorer classes; and yet even those can be reached if we use the right means.

First to instruct the coming generations and secondly to reach the ear of advanced mankind. One great help of the present day is in the meetings of the Mothers' Clubs. Back of these we have a growing and far reaching aid in the activities of the Women's Clubs. The members of these organizations have accomplished many things which the combined efforts of health officers and politicians have failed to effect. They have shown their willingness to undertake to teach the people of all classes many things which can be taught in no other way. In this line of instruction they can be of incalculable service to the practical sanitarian. They may speak upon subjects which may be forbidden to the health officer or to the family medical adviser. They are privileged to approach the female representatives of the family and receive attention. Already this factor in our work has taken on concrete form. At the last meeting of the American Medical Association the House of Delegates authorized the formation of a Public Health Education Committee to be composed entirely of women members of that association, all of whom are, of course, physicians.

The work to be done by this committee has already been mapped out and includes the presentation of sanitary questions to the several women's clubs and the organization of working committees to see that each woman's club has a share in the work.

The subject to be dealt with by them includes all the lines of work in which a health department is interested. I believe that co-operation of the health departments with the movement will be found of great service, in fact it should be the duty of health officers to see that the effort is guided in practical channels and not left to dilitante sentimentalism.

An effort to reach the people and instruct them of the danger of infantile blindness has been made by the New York State Board of Health by the issuance in several languages of instructions of what to do and what not to do in the presence of sore eyes. The Board of Health of the smallest state in the Union has sent to every physician in the state instructions to this end and with them a compact outfit containing a sufficient amount of nitrate of silver solution as an immediate precautionary treatment when ophthalmia is discovered, thus avoiding delay in procuring a prophylactic from the druggist, or in fact failure to do anything. Duplicates of this outfit are obtainable free at the culture stations. The State of New York is making the same distribution and Louisiana has ordered a shipment of similar supplies. As with the free distribution of antitoxin perhaps a few lives may be saved to the financial gain of the state.

It is to be hoped that our sojourn in this beautiful capital of the Central South will serve as an encouragement for a continuation for the earnest, new live work being done in this city. It has attracted the attention of the health departments throughout the states, sister states and provinces and is serving as a stimulus to those cities and states who have met with discouragement, for if the intelligent application of sanitary principles can be brought about by a practical executive in a new and barren field as has been done in this city, we all should surely go back to our work with renewed encouragement. We may rest assured that the good will and co-operation which has been asked for and given by us all to each other will continue to exist.

REPLY ON BEHALF OF THE UNITED STATES,

To the Addresses of Welcome on Behalf of the City of Richmond and on Behalf of the Medical Profession of Virginia.

By Prof. FRANKLIN C. ROBINSON.

[NOTE:—It has not been customary to print the addresses made before the Association at its annual public meetings. An exception has been made in the present case. Below appears the last official utterance of one of the Association's most active, most loyal, best loved, and yet, withal, most modest members. We shall miss the genial face, and the kindly wisdom and speech of Prof. Robinson, but his spirit and his influence will go on with us in our work.]

Mr. Mayor, Dr. Ross, and ladies and gentlemen of this beautiful city: What little courage I had to make this response has been taken from me by the eloquent words that I have just listened to. What little oozings of it was left have been finally removed by the President saying that I was from Massachusetts. (Laughter.)

I have had occasion during the last few days to look over the records of this Association, and I find, as many of you know, that this is the second time that it has been welcomed to Richmond. I noticed in glancing over the records of the proceedings of that first meeting, that among other things a resolution was introduced asking for the appointment of a committee to experiment upon the subject of subjecting individuals and things to an extremely low temperature in order to see if it were not possible to kill in that way the germs of disease without interfering with the individual. I do not find any record of the report of that committee, but I think that in the last few hours I have discovered something that may bear upon that problem, and possibly, although it may not have been solved during these thirty years last past, we may be in line for solving it now. I found an hour or two ago that I was expected to respond for the United States at this meeting. I had known nothing about it. I was really congratulating myself that having made a few feeble remarks this afternoon, I was through with all responsibility connected with this affair, but when a kind friend, in fact three of them, called my attention to

what was upon the program my temperature suddenly fell, so I think that along that line this old problem may be solved, and I would recommend to those who are interested in destroying germs to try something of that kind. Just announce to a man suddenly that he will be called upon to perform a service like this, and, if he is constituted as I am, I will guarantee such a fall in his temperature, as will kill the most resisting germ. I may say also that this committee which informed me of this duty did not make the matter any better by telling me, as one did, that it was all right, that I did not need to say anything, while another one said, "Why, you can talk on anything, and talk is all that is wanted, not sense." while still another simply stood there and laughed, which was the worst cut of all. But when I came to this meeting, and on this platform, and realized that I was expected to speak for the United States, and discovered at the same time that among the gentlemen here were Dr. Sternberg, so long an official of the United States, at the head of the Medical Division of the Army, and Dr. Wyman, who has done so much for public health in his official connection with the Government, it seemed absurd that a man from the extreme Northeast, a part of the United States that the Canadians are hardly willing to allow belongs to the one country, should be called upon to do this service, which could be so much better done by another.

Your mayor has gone over the history of sanitary work, and the great blessings that have come from it. The history of this Association is luminous in that respect also. When that meeting was held here a little more than thirty years ago the feeling of those gathered was far different from what it is now, because of that same progress to which he has referred. Then the Association met in the gloom of a tremendous epidemic of yellow fever that had scarcely abated, an epidemic that had spread over this southern country, and a considerable portion of the north also, claiming thousands of victims. There was practically no scientific knowledge of the disease then, and little could be done to stop it; and yet in the face of that gloom, and that discouraging condition throughout the country, those few noble men came together at the invitation of the people here, and counselled as to what they could do in the future to stop similar epidemics. Within the past

thirty years all of that gloom has practically disappeared. We are not disturbed now about epidemics of that kind. We know how to handle them. It is not the "pestilence that walketh in darkness" that troubles us so much as the "destruction that wasteth at noonday." It is the things that we can see that trouble us now. The whole matter of sanitation has taken on a broader aspect, and yet it is rather interesting to notice that in that very meeting of thirty years ago, with the courage and prophetic vision that those men had, they even then looked forward to the time when conditions would be as they are now, and they passed a resolution, one of several great resolutions that they passed at that time, stating that the object of the Association was not simply to stay epidemics but to raise the study of medicine to that point where false theories should give place to real scientific pathology and etiology in case of all diseases. That time has now come. We know how to handle epidemics and we handle them, and the broad object for which this Association was originally founded is now being carried out, with the bettering all round of the human race. During that time there has been a tremenduous work done by this Association and as I have said, a great many victories have been won. Epidemics have been studied and practically conquered. It is not so much now a question of Health Boards pushing the people forward in sanitary matters, fighting for a right to live, but they are actually put to it to keep at the head of the procession. We see everywhere the awakening of conscience in sanitary and public health work, and the great problem that now confronts us is the problem of organizing along sane lines because of this uprising of the people demanding healthy conditions. Of course there are places where the old ignorance remains, but we are perfectly certain that one of those places is not this city. We came here knowing that sanitary conditions were very progressive. There have been places in the past, and there may be places in the future where this Association will go largely for the purpose of doing missionary work, but we did not come to Richmond for any such purpose, but we came rather to see the things that we had heard of, and to get information as to how they were being done, for we were of the opinion, which our coming has made a certainty, that that same courage referred to by the eloquent

Doctor, that same courage that defended this city against external foes is now putting itself in line to assist these men who are laboring to improve the sanitary condition of things; and that, I am convinced, is the reason why Richmond is in the van of sanitary progress today. So I say that this Association no longer stands for any narrow things, but for a broad interpretation, for the building up of humanity in general, and the only sentiment that I can give you in closing is this:

Here's to the City of Richmond,
To Levy and all of his crew.
And here's to the next time we come here,
God grant that the years may be few.

–(Applause.)

REPORT OF THE COMMITTEE ON NECROLOGY.*

We are indebted to Dr. H. P. Wolcott for an obituary of Charles Harrington, M. D., which appeared in the Boston Medical and Surgical Journal.

Charles Harrington was born in Salem, Mass., July 29, 1856. A student for a time in Bowdoin College, he transferred himself to Harvard and was graduated there in 1878. He at once entered the Medical School at Harvard, and received the degree of M. D. in 1881. He continued his medical studies abroad, spending two years in the schools of Leipsic, Strasburg and Munich. In the last-named city he was brought into relations with Pettenkofer, the veteran leader in the modern school of sanitary science. Under this strong influence he probably received the impression which determined his future career.

Upon his return home, in 1883, he received the appointment of assistant in chemistry in the Harvard Medical School; in 1885, in addition to the position of assistant in chemistry, he was made instructor in hygiene and assistant professor of hygiene in 1898. He became a full professor in 1906. He became associated with the work of the State Board of Health in 1883, as assistant to the late Prof. E. S. Wood, who had charge of the Department of Chemistry, under the Food and Drug Act of 1882. In 1889 he was made chief of the office of Inspection of Milk and Vinegar for the city of Boston. In this important position his work was characterized by thorough knowledge, efficiency and courage, and he survived the changes of political parties as only that public servant can who devotes himself with a high mind to the performance of his legitimate duties.

In 1901 he became a highly valued member of this Association.

Dr. S. W. Abbott, the efficient secretary of the State Board of Health, died suddenly in October, 1904, and Dr. Harrington was in the same year elected to that office. Dr. Harrington had already earned a wide reputation, not only through the publica-

* Read before the American Public Health Association, at Richmond, Va., October, 1909.

tion and records of his official work, but also through the best known of his publications, the book entitled "Practical Hygiene." The sterling worth of this was promptly recognized. It has already reached a fourth edition and is one of the most satisfactory manuals upon the subject which has been printed in any language.

Thus prepared and thus qualified, he found in his new place an ample field for his activities. Few persons, even in the medical profession, realize how important and varied have become the functions of the State Board of Health, created in 1869. The powers then bestowed upon it were largely advisory and the appropriations of money given to it were small, though sufficient for such duties as had been entrusted to it. In the course of years it has so far commended itself to the good will of the people that liberal appropriations have been freely made for such aid to the public welfare as no other community, in this country, at least, enjoys; and the strenuous work of the executive officers of the board has been proportionately increased. With the latest legislation of consequence, that giving to the board the active assistance of the fifteen district health inspectors of the state, a consummation has been reached wherein is given to this state a complete sanitary system reaching from the smallest village to the largest city of the commonwealth, and yet so contrived that local powers and responsibilities have not been essentially diminished.

The so-called filth diseases of the earlier day have other and more complicated relations to the life that surrounds us than any which the sanitarians of the past generation imagined they had found in the appalling dirt and neglect which seemed to be not only the home but the proximate cause of epidemic disease. The discovery of the microscopic organisms peculiar to the various communicable diseases promised a greater relief than we in our subsequent experience have been able to procure. It was at first assumed that certain bacteria, for instance, gained entrance to the body, did their mischevous work and disappeared. We now know that this is not always so; the patient may, after recovery, still be the host, for a longer or shorter period, perhaps for life, of the organisms which are a menace to the health of the community, though not to him. Such questions as this, directly

involved in the prevention of disease, must occupy the attention of the health officer of to-day. In addition to these are all the duties which usage and legislation have relegated to the health authorities—the care of public water supplies, the treatment of sewage, the disposal of wastes, the purity of foods and drugs, the protection of life in tenements and factories, the suggestion of useful legislation in relation to the public health.

We live in an age, fortunately, where there is conviction on all sides that something must be done to improve the conditions for healthful living; everywhere there is a waiting for authority to declare what shall be done. Knowledge and method and wide outlook are necessary and the clearly defined purposes of leaders who can establish principles and maintain them. To this much-needed class of sanitary authorities Dr. Charles Harrington belonged.

His friends knew that he was able and well qualified for the new work; not all of them were convinced that he possessed the patience which is so indispensable to the public servant who waits upon the will of a large legislative body. Any apprehensions that may have existed in this regard soon came to an end. He communicated much of his own enthusiasm to the committees with which he was brought into contact, and his warm advocacy of the plans of the board which he represented made and did not lose friends for the cause he had at heart. Together with a natural impetuosity of temperament he had the unusual concomitant of a well-ordered and most industrious habit of work. Few men in public service gave more time than he to the drudggery of an office, yet at the same time he was the efficient professor of an important department in the Medical School of Harvard College, and a committee worker, whose attendance and attention to business could always be obtained.

He was a member of the various associations which have to do with hygiene in its many aspects. He was the chosen representative of his fellows in the public assemblages where questions of moment relative to the public health are discussed, and he was always a man of mark in such gatherings. The end of all these useful activities came too soon for one who seemed to have the assured prospect of many years of successful work in a field so well prepared.

It is with feeling of deep sorrow that I come now to speak of one we all admired in life for his noble character and with tenderest emotions we pronounce the last words of love and appreciation, giving thanks to Almighty God for his life, the influence of which will be felt for all time.

Henry Lomb was born November 24, 1828, at Burghaum, in Hesse-Cassel, Germany, where his father was a prominent lawyer of the district. His mother died when he was 5, his father when he was 9 years of age, and he had to leave his home when 12 years old to live with an uncle. With him he remained about six years, being apprenticed part of this time with a cabinet-maker.

In March, 1849, when about 20 years old, he sailed from Bemerhaven for America and after a voyage of forty-two days arrived in New York on the first of May. He left the same day for Rochester, expecting to meet friends there. Here he worked at his trade of cabinetmaker until 1853, when his friend J. J. Bausch, offered him a partnership in his optical business which offer he gladly accepted, appreciating, however, that the advantages he could bring to the business would be rather moderate, his financial possessions being limited to $60. The business was conducted as a retail optical store, Mr. Bausch and Mr. Lomb making, besides, occasional trips to neighboring towns, partly for the purpose of selling their goods and especially to make their business better known in the surrounding country.

In 1861, at the outbreak of the Civil War, he responded to the first call of President Lincoln, and on April 23d enlisted in Company C, Thirteenth New York, for a period of two years. At the first election of officers he was elected first sergeant, and later during the term of service promoted to first lieutenant and then captain of the company, serving with his regiment until the expiration of its two years' time of service. Returning with it to Rochester, he was mustered out with his regiment May 13, 1863.

After returning from military service Mr. Lomb resumed his previous business activities. He was married in 1865 to Miss Emilie Klein, of Rochester. In 1866 the firm decided to dispose of its retail business and give its entire time and attention to the manufacture of optical goods. The firm at the same time decided

to make New York City the selling place for all goods manufactured and Mr. Lomb went there as manager of the sales department of the business, Mr. Bausch remaining in Rochester as manager of the manufacturing department.

Mr. Lomb remained in New York until 1880, when he returned to reside in Rochester. He continued his residence in that city until his death. In 1908 he had the satisfaction of celebrating the fiftieth anniversary of the formation of the partnership of their successful business. Outside of his business Mr. Lomb had been mostly interested in matters of health, education, veterans of the Civil War, Grand Army of the Republic and associations affiliated with the Grand Army, the German-American Society and in some other charities.

In 1884 he became a member of the American Public Health Association and at that time offered through the Association prizes amounting to $2,000.00 for the best essays on the following subjects:

"Healthy Homes and Foods for the Working Classes", "The Sanitary Conditions and Necessities of Schoolhouses and School Life," "Disinfection and Individual Prophylaxis Against Infectious Diseases," "The Preventable Causes of Disease," "Injury and Death in American Manufactories and Workshops and the Best Means and Appliances for Preventing and Avoiding Them."

In 1888 he offered another prize of $500.00 for an essay on "Practical Sanitary and Economic Cooking Adapted to Persons of Moderate and Small Means." All these essays were published by the Association, and large numbers of them have been distributed to the great benefit of the people in different parts of the country. Mr. Lomb was elected a life member of the association at its annual meeting in 1885.

In 1885 Mr. Lomb assisted in organizing the Mechanics Institute and was elected its first president. After holding that position until 1891 he declined a re-election, but continued to be one of the directors since, working for the institute in various ways which seemed the most practical to him.

His interest in sanitary work never abated as was manifested by his leaving a bequest of $2,000.00 to the Association to aid in its work.

Mr. Lomb established in the Mechanics Institute a scholarship entitled "The American Citizen Soldiers' Scholarship," to give forever to the descendants of the veterans of the Civil War opportunities to obtain some useful instruction in some of the most practical classes of the institute.

In 1883 he assisted in organizing the German-American Society on the occasion of the celebration of the second centennial of the first German colonization within the boundaries of the United States, which Society has been so beneficial in assisting the German immigrants as well as those who, from want of knowledge of the language and conditions of this country, needed help. No man ever more fully fulfilled the Divine injunction to "love thy neighbor as thyself."

It is with great sorrow that we learn of the death of Henry Lomb, for many years an honorary member of this Association—a man of modest, kindly ways—a philanthropist, who by generous gifts to this Association, extended the knowledge of sanitation to a large body of the people. We take this occasion to recognize the liberal bequest of two thousand dollars received from his executor to be used to further aid in our sanitary work. The Secretary is directed to forward to said executor our appreciation and acknowledgment of the same.

Joseph Forrest Kennedy, M. D., born 1834, was elected to membership in this Association in 1885; was secretary of the State Board of Health of Iowa for twenty-two years, and of the Iowa State Board of Medical Examiners; Editor of the Health Bulletin; was Vice-President of the Conference of State and Provincial Boards of Health of North America; seven years Secretary of the State Medical Society and for several years of the Polk County Medical Society, also County Physician; Professor of Obstetrics in the State University and United States Pension Examining Surgeon. In 1907 he removed to the Pacific Coast hoping to regain his health, which had not been good for the previous year. He died from abscess of the liver at Los Angeles, September 26, 1908, aged seventy-four.

Quitman N. Kohnke, M. D., of New Orleans, born 1857; graduated from Tulane University 1890; united with American Public Health Association at the meeting in New Orleans 1902. He was for eight years President of the Board of Health of New Orleans. At one time he was a member of the City Council; was active in the yellow fever epidemic of 1905. He died at his summer home in Covington, June 26, 1909, from cerebral hemorrhage, at the age of 52 years.

Doctor Farquhar Ferguson, of New York, died in March, 1908. He became a member of the Association in 1892. The following extracts from an obituary presented before the Medical Association of the Greater City of New York show the esteem in which he was held by his colleagues who knew him.

"He was known to his friends as Dr. Frank Ferguson. He was of Scotch descent, and was born in 1852 in Sydney, Cape Breton Island, Canada. At an age when many of us are well along in our medical studies he could speak only his mother tongue, Gaelic. He acquired by laborious effort an extraordinary command of the English language. How successful he was in this direction I leave to those who have heard him in conversation, in the lecture hall, and at professional meetings. He had the unusual faculty of expressing his thoughts in the simplest phraseology, and with the most complete lucidity, and his sentences were enunciated with a fascinating burr. Coming to New York shortly after attaining his majority, his first medical training was in the New York Hospital as an orderly. Later, under discouraging circumstances, he matriculated at the Long Island City Hospital, whence he was graduated in 1880. In that institution, from 1883 to 1887, he occupied with distinguished success the chair of histology and pathological anatomy. From 1883–1888 he was pathologist to the New York Hospital, where a few years before he had been orderly. He was also professor of pathology and clinical medicine at the New York Post-Graduate Medical School, pathologist at St. Luke's Hospital, the Chambers Street Hospital and the department of the insane at the New York Hospital (Bloomingdale Asylum), consulting pathologist to the New York Department of health, and attending physician to the Columbus Hospital.

"Dr. Ferguson was an indefatigable worker. He was a microscopical pathologist and a microscopist of marked ability, and at the same time a clinician of extraordinary acumen. It has always seemed to the writer, however, that his chief claim to lasting distinction lay in his unusual talent for teaching. He was one of the chosen few who had the ability to clearly and convincingly transfer to the student mind the results of personal knowledge, observation and experience, and it is one of the writer's happiest memories that he was privileged to enjoy a close intimacy with and instruction from this master intellect. As a man Dr. Ferguson was clean, straightforward, honest and upright; as a friend he was most genial, sincere and charming; as a teacher he won respect, esteem and affection of his students; as a practitioner he was consientious, painstaking and discriminating. As an example of unwearying diligence and indomitable perseverance, in the face of what to many of us would have seemed insuperable obstacles, his life was surely an object lesson of no small significance."

Dr. HENRY D. HOLTON, Chairman.

Section of Municipal Health Officers

UTILIZATION OF BACTERIOLOGIC AND MICROSCOPIC METHODS IN THE INSPECTION OF MILK.*

By JAMES O. JORDAN,
Boston, Mass.
(Boston Board of Health, Bureau of Milk Inspection.)

The progress towards a foundation for better milk supplies has been rapid in recent years, and there is no room for doubt that much improvement has already resulted. Various agencies have been employed in this cleaning-up-process, and each has no doubt been a feature in the betterments already achieved.

Prominent among the means employed is that of the bacteriologic examination of milk, and the progress of this method has been rapid; and it is now utilized in many cities in the contest being waged against stale and dirty milk.

It was thought that the extent of the development of bacteriologic and microscopic examination of milk in this country would not be lacking in interest and at the same time useful to those already pursuing this work, as well as to others having it under consideration, or contemplating the adoption of standards.

With this idea in mind, the following questions were addressed to the health authorities of forty cities, thirty-five replies being received:

1. Does your city have a bacteriologic standard for milk, and if so, what is it?

2. Is your standard, if any, established by Board of Health regulation?

3. Does your department make bacteriologic examinations of milk samples? If so, (a) how many yearly, and (b) what action, if any, follows the finding of samples containing bacteria in excess of your limit?

* A compilation of statistics in thirty-five cities. Read before the Joint Session of the Section of Municipal Health Officers and the Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

4. Do you make microscopic examinations of milk sediments? If so, (c) how many yearly, (d) for what purpose, (e) what action, if any, follows these examinations?

Under query 1 it was found that 14 cities had legally established standards, and of this number 11 had placed the limit at 500,000 per c. c., while 1 (Oakland, Cal.) had a dual standard, namely, of 100,000 from April 1 to Nov. 1, and of 75,000 from Nov. 1 to April 1; and another, Montclair, N. J., had placed the limit at 100,000. Chicago's standard follows: Milk on arrival in the city from May 1 to Sept. 30 should not have more than 1,000,000 bacteria; from Oct. 1 to April 30, not over 500,000 organisms. Chicago's regulations further provide that milk for delivery to consumers shall not contain an excessive number of bacteria, and the sale of milk containing over 3,000,000 bacteria is prohibited. Chicago has also the following standard for pasteurized milk, which as yet is without legal sanction: May 1 to Sept 1, 100,000; Oct. 1 to Apr. 30, 50,000.

Twenty-one cities were without legal standards, but the health authorities of four of these had established arbitrary limits (1 at 100,000, 2 at 500,000, and 1 at 1,000,000), while the sanitary code of another (New York) provides that milk with an excess of bacteria shall be considered adulterated. Microscopic sediments are utilized for bacteriologic examination at New Haven, Conn. Thus the number of cities without some bacteriologic limit as a means of control is reduced to 15, and two of these, Baltimore and Washington, have the establishment of standards under consideration. Furthermore, in six of this last named number of cities, bacteriologic counts are being made and high counts are utilized as a means of obtaining improved conditions. Two other cities make infrequent counts of milk specimens.

The answer to question 2 indicated that of the fourteen cities with legalized standards, the limits in nine instances had been established by health authorities, and in five cities by the action of their respective city councils.

The replies to query 3 showed that in only ten cities were no bacteriologic counts being made; three of these were cities with legal standards, but one, (Salt Lake, Utah), had but recently adopted its limit. A few cities submitted no figures as to the

number of samples examined yearly, but with those giving information upon this point, the number was found to vary from 100 to Boston's maximum of 5,843.

Practically all of the cities are using high counts as a means of improving supplies, through notification of the dealer of the finding of excessive numbers of organisms. In many instances these warnings are followed by cooperation with the dealer in an attempt to discover and correct the faulty conditions and where possible, visits to dairies are also made for the same purpose.

Some municipalities exclude supplies where repeated warnings fail to bring improvement; one, (Montclair, N. J.), makes the findings public. A few cities have the right to revoke permits where excessive counts are found, but so far as could be learned, this privilege has not yet been exercised to a great extent.

Investigation further indicated that in only two cities, Boston and Brockton, (Mass.), has legal action been invoked. These cases all resulted in favor of the government, but in these cities the educational policy is the chief one utilized in connection with this work.

Query 4 disclosed the fact that in fifteen cities microscopic examination of milk sediments were made; this line of investigation was also to be taken up at once by another city.

The number of specimens examined each year varied from 200 to 5,843. The purpose for which these examinations were made was to determine whether or not milk was contaminated with pus, streptococci, blood, and dirt. The finding of pus, streptococci, and blood is followed, in the majority of instances, by an attempt to locate the cows responsible for the abnormal conditions by examination of samples of individual animals, with subsequent exclusion from the supply of the milk of animals found to be at fault. Boston excludes this abnormal milk until such time as the dealers ascertain and separate unhealthy animals from the herd, or keep their milk from the supply sent to market, In one city, (Louisville, Ky.) the finding of leucocytes in masses has led occasionally to the detection of bad udders, and prosecution where dairymen seemed disposed not to aid in correcting the difficulty. In another city, (Buffalo, N. Y.), the

authorities have never failed to find one or more of the cows with a suppurative disease, where a prior examination of the milk revealed the following associated conditions:

1. Exceedingly high bacterial count.
2. Abundance of small sized, 6 to 8 element streptococci.
3. Undoubted presence of pus.
4. Low temperature.

At New Haven, Conn., the finding of dirt is followed by a warning, and failure to improve conditions by exclusion of the supply. Of 500 producers in 1907, 2% were shut off permanently; in 1908 only a fraction of 1% were excluded. In 1907, 37% of the dairies showed dirty production, and in 1908, 26%. In a few cities with near-by dairies this microscopic work is supplemented by veterinarians, who make examinations of the animals.

CONCLUSIONS.

I. The value of bacteriologic counts and microscopic examination is denoted by the fact that in no city where this work has been commenced, has it ever been abandoned.

II. Without disparaging the work done in any city along clean milk lines, it cannot be gainsaid that bacteriologic examination is the severest test which can be applied to the milk supply of any municipality.

III. The action of Boston's Health Department has been followed almost universally in adopting a standard for bacteria, namely, that of not over 500,000 per cubic centimeter.

IV. In the present development of this science, and in view of the vast amount of work which remains to be done in securing proper methods for the production and handling of milk, the instituting of legal proceedings upon a finding of high bacterial content appears ill advised, where the right to stop the sale of milk is vested in Boards of Health.

Better results will undoubtedly follow, if an educational plan is adopted in conjunction with the revocation of permits where continued high counts are found, and where warnings fail to bring improved conditions.

REPORT OF THE COMMITTEE ON MEDICAL INSPECTION OF SCHOOLS.*

Your Committee on Medical Inspection of Schools has found little in the line of development or new material in school inspection during the last year, or since the very complete review of school inspection by Gulick and Ayers, published by the New York Charities Publication Committee last year. The writer, however, desires to refer briefly to portions of school inspection as now performed in this country, for the purpose of emphasizing certain important requirements for successful results. It is gratifying to say that school inspection in a larger or smaller sense is in successful operation today in more than half of the United States, and in at least one hundred cities of those States. It has passed wholly beyond the experimental stage, and is (either legally or by general consent) an established part of the public policy in the care of school children. It has abundantly demonstrated the fact that extensive and varied forms of disease and of defective mental and physical conditions are to be found among the children in both public and private schools. It seeks to discover and remove from the schools infectious diseases in their earliest stages, and to discover such other defects as may deprive the child of doing a nominal amount of school work, and to advise what timely changes and care may be necessary to remove or mitigate those disabilities, to the great advantage of the school children.

Public efforts to deal with School Hygiene or School Inspection in some form and in varying degrees, dates back in France, Sweden, and Germany, several decades, with a gradual development to the present time. Medical Inspection of Schools in this country as proposed in Boston by the writer in 1890, was provided for in 1891, and put in operation in 1894. It comprehended at that time daily medical inspection of all public and parochial school children who betrayed to the teacher by complaint or appearance any illness, whether of an infectious or non-infectious

* Read before the Section of Municipal Health Officers of the American Health Association at Richmond, Va., October, 1909.

character, the exclusion of infectious cases, the advising the teachers as to the proper disposition of all other cases of illness or disability. It was also proposed at that time to make physical examinations for defective sight and hearing, and for curvatures of the spine; but owing to the delay and difficulty in securing school inspection in any degree, the physical examinations were postponed. The same corps of school physicians were required to examine and approve or disapprove the isolation of all cases of infectious disease in the homes, and to examine such cases for release on their recovery. The equipment for successful medical inspection of schools may be said to consist primarily of a corps of competent school physicians, school nurses, and all of the teachers, with the co-operation of the parents, masters, school committee, and the Board of Health.

The school physician should be one who is well recognized among other physicians, should possess the temperament and tact necessary to get on harmoniously, and give the necessary time to his school work. It is well for the school physicians to organize and meet several times during the school year, to discuss school inspection. There should be allowed not less than one properly trained and tactful school nurse to each three thousand school children. Her duty should be to aid the teachers in detecting all children who are ill or who for any cause should be presented to the school physician for diagnosis, to aid the latter in his inspections, and record of cases, and in securing any necessary treatment by the family physician, at a dispensary, or when necessary by giving the treatment herself under the direction of the school physician. In the opinion of the writer the effectiveness of medical inspection in schools is at least doubled by the aid of the school nurses.

It may be unfortunate that the teacher is already burdened with duties, but the teacher, always present, constantly familiar with the appearance and condition of the children, competent and alert to detect any changes from normal to abnormal conditions, becomes at once the most competent, available, and practical selection for this important and first step in the roll of school inspection. It is not only unnecessary, but in the opinion of the writer wholly unreasonable to expect the teacher to make diagnoses; reporting abnormal conditions should be sufficient.

If teachers should need instruction to become more expert in detecting abnormalities in the school children, they may as easily acquire ability for this as for any other part of their work, and it will prove a valuable asset in their usefulness as teachers.

The question of whether medical inspection of schools should be administered by the Department of Health or by the Department of Education is one to be treated with great care and patience, and until more expert and deliberate study of the question shall be gained, the writer would counsel the greatest effort for harmonious co-operation between the school and health authorities.

Samuel H. Durgin, *Chairman.*

THE ORGANIZATION OF THE MUNICIPAL HEALTH DEPARTMENT AT VERA CRUZ.*

By Dr. M. S. IGLESIAS,
Vera Cruz, Mexico.

The short time at my disposal within which to give you some information on the methods adopted by the Municipal authorities for the care and protection of the inhabitants of the City of Vera Cruz, oblige me to limit my paper to a brief summary of the different services established with that object, without entering on details, however interesting they might be; but I believe that it will be enough to enable you to form an idea of the interest which those authorities display in all matters relative to both public and private hygiene.

The preservation and improvement of the sanitary conditions of the City of Vera Cruz, is under the charge of three offices, which although separate in their work, mutually support each other and co-operate for the same purpose, and are the following: The City physicians who are at the same time given charge of the whole county; the Inspectors of food and drinks; and the service which is denominated, "Yellow Fever Campaign." All of these are connected with the City Board of Health, which is the advisory body on all matters connected with hygiene and public health, and the members of which are the physicians at the head of the above services.

The first office above mentioned, besides rendering other professional services which are not directly connected with hygiene, administer vaccination, inspect public women in order to prevent the spread of venereal diseases, visit the houses in which persons are suffering from transmissible disease in order to ascertain whether their isolation is really effective, and if not, to order such patients to be removed to the proper establishments in which they can be really isolated; they issue death certificates for the persons who have died without medical attendance; and

*Read before the Section of Municipal Health Officers of the American Public Health Association, at Richmond, Va., October, 1909.

they classify in accordance with the Bertillion nomenclature, the different causes of the deaths which are registered, so as to form reliable statistics. All of these labors are executed with admirable regularity and efficiency, and the best proof of this lies in the fact that if, by any chance, a case of smallpox is discovered, which almost always comes from outside of the City, or a spontaneous case, which is very rare, the disease does not spread amongst the rest of the inhabitants of the City, and consequently does not form a focus, or develop any epidemic affection, which shows that all the residents are duly vaccinated and for this reason Vera Cruz can boast that it is one of the few cities in the Republic, perhaps the only one, in which smallpox does not present itself in an epidemic form.

The Inspectors of food and liquors, who are as a rule expert chemists, fulfill the duties which pertain to their office, by collecting samples of the different food products and liquors which are found in the markets and stores, and which are taken to their own private laboratories for analysis, reporting the result to the municipal authorities in order that the adulterators may be punished and adulterations or imitations prevented. It would require too much time to explain all the circumstances which have hitherto prevented the establishment of a Municipal Laboratory dedicated to the above purpose, but recognizing the importance of such an institution as a guarantee of public health, steps have been taken to overcome the difficulties which have arisen, and there are well grounded hopes that it will be established within the near future, as the authorities who are charged with the care of the public health, do not for a moment doubt that the adulteration of food and drink, and the defects of the Inspection service, are, if not the sole, at least the principal cause of the enormous mortality which is registered through diseases of the digestive organs.

The staff which is charged with carrying on the campaign against Yellow Fever, does not confine its work to this disease, but also extends its labors to the struggle against malaria and to the correction of all the infractions committed against hygiene, both public and private, throughout the city. All the houses in the city are visited three or four times every week, in order to ascertain the conditions of the health of the inhabitants, and a

register is kept of all changes of domiciles, as well as of those who arrive or leave, for which purpose a general schedule is kept, in which the individuals are classified as immune or non-immune to Yellow Fever. Whenever the sanitary agents find any of these travellers, or a person domiciled in the city suffering from feverish symptoms, the Medical Inspector of the Ward in which such person lives, proceeds to examine him in order to form a diagnosis, and if he finds the case either doubtful or confirmed, he orders the isolation of the patient in a screened room under the conditions which are required by science, either in the patient's own house, in the sanitary station which is specially dedicated to that purpose or in the proper wards of the hospitals, and a fresh examination is then made by all the physicians employed in the "Yellow Fever Campaign," in order to rectify or confirm the diagnosis of the physician in charge of the ward. If the disease is found not to be yellow fever but some other form of transmissible disease, they recommend precautions which are to be adopted and report the case to the Municipal Physicians, in order that the latter may take the necessary steps.

Besides the above described investigation of persons suffering from fever, the yellow fever staff inspects all the water reservoirs, to discover whether they contain larvae of mosquitos, spread oil on those which are found and order that all should be kept covered in order to prevent their being converted into breeding tanks of mosquitos, and also see that such orders are properly carried out. They inspect the water supply and other sanitary plants, to ascertain whether they are kept in good condition, and order the defects which may be discovered corrected within a specific term.

They fumigate the houses in which suspected or confirmed cases of yellow fever have been observed, or of malaria, in order to exterminate the mosquitos which may be found there, and they also disinfect those houses in which any person has been sick with a transmissible disease, in which case, they forward the bed and personal clothing which may be contaminated, to the Port Sanitary Station, in order that they may be disinfected in the stoves dedicated to that purpose.

It is the duty of the Sanitary Engineer who forms part of the above staff to attend to the drainage of the ponds and other water deposits which may be formed during the rainy season, the filling

up and grading of the ground so as to prevent the formation of such ponds, the clearing of the brush which may grow up within the city limits and neighborhood, so as to destroy the places in which mosquitos can breed. It is also his duty to examine the special plans and schemes for the drainage of houses which are to be built, as well as the works existing in the houses already built, taking care that all these works are executed in accordance with the approved designs and the provisions of the Sanitary Laws, and also that they are constantly kept in good order.

The beneficent results of this service have already made themselves evident; yellow fever has disappeared from the city, and if by any chance, in spite of all the precautions taken, some person suffering from that disease should reach the city, it is very certain that it will not spread and give rise to the terrible epidemics of former years; malarial fevers have notably diminished; mosquitos are so scarce that people can sleep without mosquito nets; none of the other transmissible diseases are observed, and the mortality from other causes which exclusively depend on the hygienic conditions of the city, is also greatly diminishing.

WHAT MAY BE DONE TO IMPROVE THE HYGIENE OF THE CITY DWELLER.*

By S. ADOLPHUS KNOPF, M. D.

(ABSTRACT)†

The author discusses the following matters relating to tuberculosis:

Duties of the state, federal and municipal authorities; public drinking fountains; soda water fountains; public toilet facilities; bathing and swimming; individual odors; street sprinkling and flushing; air in cities; the value of wind; smoke nuisance; obnoxious gases and fumes from factories and automobiles; collection of garbage and ashes; mineral and vegetable dust; street cleaning; tree planting, and traffic regulations; automobile noises; other avoidable city noises; insanitary bakeries and insanitary handling of bread; mosquitoes, flies and other pests; alcoholism and the city dwellers; cremation and simple funerals; railway and street cars; the spitting nuisance; ventilation of public places; church hygiene; workers in factories, offices, and stores; home and private hygiene; roof gardens and roof play-grounds, and outdoor life for adults; school roof gardens and play-grounds during vacation; height of buildings and width of streets; the air of congested districts; indoor arrangements and heating of homes; cleaning and sweeping of rooms; toilet rooms; care of the tuberculous and the insane; convalescent homes; employment bureaus; care of the morally ill; individual responsibility and prevention of accidents; prevention of fires; family and personal hygiene; dress reform for men and for women; the social ill, "New Yorkitis"; fads regarding disease; the physician and the diseases of the mind and soul; the simpler life; the duty of the family physician; child hygiene and breast-fed babies; school hygiene; care of children afflicted with whooping cough, tuberculosis, and measles; child labor, and race suicide.

* Read before the Joint Session of the Section of Municipal Health Officers and the Laboratory Section of the American Public Health Association at Richmond, Va., Oct,, 1909.

†Published in full in the Medical Record, Jan., 1910.

The author's conclusions are as follows:

"Is is by thorough training of ourselves as physicians and sanitarians, the awakening of the statesman and philanthropist to their duties regarding issues of public health and public welfare, education of employers and employees, of the man and woman of all classes of society, in general and personal hygiene; hygienic education of the child at school, and the practical application of the combined knowledge and experience gained in modern sociology, pedagogy, eugenics, and medicine that we may hope to make of the child of today the citizen of tomorrow, the ideal man and woman, strong, healthy, happy, vigorous, noble, and even beautiful to behold."

Section on Vital Statistics

POLICE HEALTH CENSUS OF THE CITY OF BALTIMORE. 1906.

By C. HAMPSON JONES, M. D.,
Assistant Commissioner, Baltimore, Md.

I had no idea of embodying in a paper any of this work, which was attempted by the Baltimore Health Department in 1906, first, because the results of that work were published in the annual report for 1906, and secondly, because since that time we have not been in a position to utilize the information that was obtained by this Police Census. My friends, however, have requested me to bring this subject before the American Public Health Association. I now do so with apologies for the incompleteness of the work actually done, but with the hope that the objects to be accomplished will be placed within easier reach by having the subject discussed, especially as to the desirability of such work by health officers.

For a number of years (and it is so now) our department has been classifying its mortality and morbidity reports according to the political divisions of the city known as wards. These wards include such a variety of people, not only in race and color, but also a great difference in financial condition, and therefore, in their environment; as for example, in what is known as the Second Ward, we have two very distinct sections, one North, and the other South, of Eastern Avenue. That portion south of Eastern Avenue is filled with tenement houses which are occupied to a large extent by Bohemians. On the other hand, in that portion which is North of Eastern Avenue, the people are independent, and own their own houses to a great extent, and the families are living alone.

* Read before the Section on Vital Statistics of the American Public Health Association, at Richmond, Va., October, 1909.

Again, in our Seventeenth Ward, we have the Negro population predominating to a large extent, and the mortality and morbidity rates from this ward will be high because of the large number of negroes; not so much, perhaps, because they are negroes as because a large number of them live under or are surrounded by unsanitary conditions as compared with the white people. A careful investigation discloses a further fact however; that is, that the negroes themselves are divided into two very distinct classes—those who have money, families living in separate houses, which are of good construction and surroundings, and those who are more or less huddled together, poverty stricken, and the sanitary conditions poor.

So also you will find differences in other wards of the city; and it occurred to me that there could be no satisfactory sanitary work accomplished until we could clearly demonstrate to the municipal authorities that there is a distinct difference in certain sections of a ward in the mortality and morbidity rates, which could be remedied only by municipal action; such for example. as conditions arising from overcrowding, not only the overcrowding of a house, but the overcrowding of an area of ground. Looking to the Seventeenth Ward again, we find that there are 119.22 people per acre, but this gives no idea of how crowded a few dozen blocks in the ward are; some of them would be much more crowded than the average and others much below the average. The results of the overcrowding of a few blocks of houses, therefore, could not be studied from the areas for the entire ward.

In order to demonstrate that it was possible for our Health Department to be supplied with facts concerning each block of houses in a ward, the Police Department was requested to make a Health Census. The patrolmen were instructed to go from house to house, and from family to family, if in a tenement house, and put down the names and ages, sex, color and occupation of every member of the family. Accordingly each patrolman was provided with a book with columns headed by tbe several items above mentioned, and within two weeks their report was finished. From these reports we were able to make out tables for only a few features. First: Population as to wards and acres within the wards: second, showing the death rate in each

ward; third, showing the population according to age and color in each ward; fourth, showing deaths from all causes by sex, color and ages in each ward; fifth, the deaths of children under five years of age; sixth, the death rate in each ward from each disease, according to race.

The above features are nothing more than what can be obtained from the United States Census, but our attempt demonstrated clearly that such a census can be taken by the police, and that it is only a matter of a little practice to get a very accurate census, and while we did not make use of the information, for the want of force in the Health Department, yet it is perfectly clear that we could have tabulated all of our police records according to blocks of houses instead of by wards, and it was also made clear that it is perfectly practicable to group the blocks of houses in the same ward or in adjoining wards, or even in different sections of the city, which present the same sanitary conditions. By this grouping of blocks of houses it will be possible, I think, to demonstrate more clearly than in any other way the death rate and birth rate according to race and sanitary conditions; because in Baltimore, (and I presume it is the same in other cities), people of the same nationality or race seem to try to occupy houses close together, so that you will find that where the Bohemians are once settled, there the Bohemians will congregate, and soon we have an entire block of houses occupied by the same class of people. So it is with the Jews, Italians and Negroes. And we will perhaps be also enabled to compare the birth rate and the death rate of the same race of people under different financial conditions as evidenced by their sanitary surroundings. I believe it is possible that with a little training our police force will be able to take a more accurate census than even that obtained by the Federal Census enumerations, for the reason that we have found that by far the vast majority of the police thoroughly grasp the meaning of their work, both by their reports and by their individual interest in them. The patrolman is one who gets thoroughly acquainted with the people of his beat and any changes that occur amongst those people he is the first to note it, because he is required by his superior officers to note all changes that might be of value in his police work; and if he is thoroughly trained by health officers to note the

particular features of interest from a statistical standpoint, he also will keep the Health Officers informed even of daily changes on his beat. In order to illustrate this feature, I might state that in the Bohemian district, during the Summer months, particularly in the month of June, whole houses and even blocks of houses are deserted temporarily by the people, who go into the county to help gather the crops, and therefore the patrolmen could keep us informed just when such changes occur. Again, the policemen, in the very district that needs most watching, will, after a time, be able to notify the Health Department of all funerals that occur on their respective beats, and I hope also they will demand to see the permits for burial when the corpse is removed from the house. This will materially assure us of the correctness of our death rate. We propose, when sufficient help is given to the department, to have a card index system for every house and on each card can be kept all of the data necessary in this statistical work. It will be considerable work to establish such a system, but once established, as far as the deaths are concerned at all events, it will be comparatively easy to keep up, because the average number of deaths is thirty a day, and the records on the card system could be very easily kept.

I believe that this block system will very materially aid us in finding Tuberculosis, because it is only by the house work that we can ever expect to fight the disease successfully. The census having been made by the police and the houses blocked off in the Health Department, they will be accessible to our Tuberculosis nurses, and their records of the conditions of the families and the condition of the premises will be kept in conjunction with the death rate, so that whenever the health authorities have the evidence that the conditions in a certain block or blocks of houses are such that require radical changes in the alteration of the buildings or in the removal of a number of them so that the people can have more air space and more sunlight, we will have sufficient data to convince other city authorities and the people in general, of the necessity of spending money for the betterment of any particular region. I have found that it is the want of this definite information of particular localities that has prevented health authorities from getting the necessary changes that they believe advisable.

HOW SHALL THE REGISTRATION OF VITAL STATISTICS BE OBTAINED IN THE SOUTH.*

By W. M. BRUMBY.

ABSTRACT OF PAPER.

1. Physicians must be reminded of the value of complete vital statistics.

2. The general public must be taught the value of vital statistics.

3. Undertakers must be brought to realize their obligation to society in the matter of vital statistics.

4. The laws demanding accurate reports and setting aside enough money to enforce the law and carry it into effect.

It seems strange that the sanitarian should have any difficulty in getting physicians to realize the value of accurate vital statistics, but it is a fact that the average practitioner of medicine, while willing theoretically to admit their value is not very thoroughly convinced that they are worth any great amount of trouble. So far as bringing about any reform is concerned in public health the physicians' approval is a *sine qua non*. The first object to be obtained in getting accurate vital statistics is to secure the cooperation of all practicing physicians. The public looks to the family physician for advice in all matters of hygiene and medicine. The physician may be called the door of approach to the public.

Most of them have heard lectures on the value of vital statistics and the stereotyped old fashioned arguments have lost their effect and do not make a very strong appeal to the average physician. It is necessary to dress the arguments up in new garb with many local references, concrete illustrations and other devices to attract the attention and win the cooperation of the practitioner. There is no one method of securing these ends that is equal to the Bulletin of the health authorities. Whether a state has any vital statistics at all, or whether it has, as in

* Read before the Section on Vital Statistics of the American Public Health Association, at Richmond, Va., October, 1909.

Texas, 35% or 40% returns, it is always possible at small expense to prepare a monthly, weekly, or quarterly bulletin referring to local events, epidemics, and other interesting facts relating to vital statistics. By adjusting these bulletins to local conditions and taking advantage of current topics of special sanitary interest we can popularize the bulletin among the health authorities and physicians generally. Last year tuberculosis was the slogan, this year typhoid was the most interesting topic until pellagra took the center of the stage. Comparisons between the death rate among negroes, Mexicans and whites has served to interest the practitioners of our State.

A much larger benefit to be derived from vital statistics is connected with life insurance. Certain sections of the country do not have the benefit of life insurance or else must pay an excessive premium, simply because the insurance companies suspect a high death rate in these sections. And when we consider the many millions of dollars of insurance written each year in any one state we realize that an accurate system of mortuary statistics is of great value since it enables the companies to calculate just how low they can place their rates, or it enables them to invade territories formerly considered too dangerous. If all life insurance companies would urge their medical examiners to take more active interest in this subject, they would be a wonderful factor in stimulating local interest, for the men usually selected for their work stand at the head of the profession in their several localities.

Having claimed the attention of the physicians it is not a very difficult task to enlist their interest and support in collecting and disseminating vital statistics.

The people of the South, where for various reasons the necessity for such is greatest, are to all appearances more indifferent to the recent advances in sanitation and disease prevention than any other section of our nation. These same people may be said to hold the purse strings of Government and the next step and one most essential is the education of the public upon the subject of the need of vital statistics. It is common knowledge that as the order of intelligence increases the death rate decreases, and conversely, the more ignorant a people the greater their indifference to their increased mortuary statistics. The practical man

of affairs needs to be told in few words just what service vital statistics are to society. It is not a very easy matter to explain their value in few words. The record of a child's birth is its just heritage and should not be withheld by parent or physician. In my opinion the value of vital statistics for the purpose of settling disputes about heirship, kinship, and age, proof of death and such matters is one of the smallest values. By far the greatest is in connection with the prevention of disease. Any citizen will admit that it is worth while to spend money on life saving devices of any kind. We can easily show the intelligent man that certain diseases, notably, tuberculosis in New York City, can be materially limited or decreased by intelligent sanitation. Again we can call attention to the death rate from typhoid fever in different cities or towns under similar conditions. The average man will admit in an instant that sanitation or disease prevention is a good thing. Commercial organizations were never so keenly alive as they are today to the advantages of a healthy locality in inducing prospective homeseekers to locate in their city or community. It will never occur to them, however, unless we call their attention to it, that neither hygiene nor sanitation can be intelligently carried into effect without such statistics. Vital statistics to a state is like a cash register to a merchant. It enables the health authorities to have some idea of what they are going to try to accomplish in the way of preventing disease before they undertake it. A health department without the bureau of vital statistics is like a steamship with a blind pilot.

Sanitarians are not the only ones interested in this subject and these facts can be brought home to the public best through the medium of the newspapers (our strongest educational allies), lectures to women's clubs, lectures before various organizations and assemblies, and in other ways.

Dr. Cressy L. Wilbur, the leader in vital statistics work in America states that no system of vital statistics without compulsory burial permit has ever been a success in any state of the Union. This implies labor on the part of the undertaker. I am happy to state that the undertakers in Texas, and I trust elsewhere, have been public spirited enough and far-sighted enough to be willing to do their part in collecting vital statistics. The physician or accoucher is required to report births and it is only

fair it seems to me that the undertaker should be required to report deaths. To be of value the death certificate must contain all of the items of, and should be in fact a copy of, the standard death certificate. The undertaker going into the home after the death occurs, which the physician does not always do, can more easily collect the different items of information and record them.

Admitting then, that the undertaker is necessarily and logically the person to report the death, the next step in securing vital statistics is to secure their active cooperation in the work. This can be done by addressing the association of the embalmers or undertakers, by private correspondence, or by having certain embalmers or funeral directors of high rank meet with the sanitarians and devise ways and means for stimulating interest among their fellows.

Conceding then that the physicians of the state are willing to report and advocate vital statistics, the general public realizes the necessity for such statistics, the undertakers are willing to do their share, it then remains only to introduce in the legislature a bill of the required character, carrying sufficient appropriation for maintenance and severe enough penalty in case of non-compliance. Thus we would first enlist the moral support to those whose duty it is to make returns; next a demand at the hands of the thinking public would promote more active interest of the indifferent ones; but finally the most healthy stimulus for the derelict is the fear of the law.

Our law makers seldom raise an objection to the wishes of their constituents, *vox populi est vox dei.* The representative to the legislature from a city is already alive to most sanitary reforms however; his county brother, although possibly of equal intelligence, not facing such problems in his community as are forced upon his city associate, fails to appreciate the usefulness of legislation on the subject, particularly when money is required for its installation. It costs something to collect and compile statistics, and there are always watch dogs to guard the treasury. This form of objection is oftentimes fairly stubborn, but not usually very intense. A few petitions from different medical and hygienic societies, associations of funeral directors, women's clubs, aided by a few timely editorials in the big dailies will, if fortune so decrees, overcome all of the opposition and carry the desired law into effect.

Laboratory Section

STUDIES ON INHIBITION, ATTENUATION AND REJUVENATION OF B. COLI.

By FRANK E. HALE and THOMAS W. MELIA.

There has been much discussion and uncertainty as to the delicacy and relative value of dextrose broth and lactose bile in testing water of fairly good quality. The present investigation was undertaken with a view to throwing light upon this subject.

Comparison has been made between plain broth, dextrose broth, lactose bile, lactose broth and other liquid media under greatly varying conditions, artificial and natural. In the case of plain broth, 1 cc. was transplanted at the end of twenty-four hours into lactose bile and in some series into dextrose broth. In other series dextrose broth was transplanted into lactose bile.

Experiments under Artificial Conditions.

Two sets of experiments were devised and carried out in different years with practically the same results. The object was to ascertain whether dextrose broth would show gas formation in higher dilution than would lactose bile. The first series was carried out with well water, the second with surface water. In each case, the water was not sterilized but was tested with both dextrose broth and lactose bile to prove the absence of gas-forming bacteria. The surface water was in addition incubated at 37° C. for two days before testing for gas-formers. A pure culture of *B. coli* was then introduced into the bottles of water and the samples kept at three temperatures, 37° C., 20° C., and 8° C. Daily tests were made upon each sample with dextrose broth and with lactose bile in quantities of 10 cc., 1 cc., 0.1 cc., 0.01 cc., etc., using a sufficient number of

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

dilutions by tenths to always obtain the zero point, until gas formation was no longer obtained in 10 cc. of the water. As no gas-formers were originally present, the formation of any amount of gas, no matter how small, in the dextrose broth indicated *B. coli*. Unsterilized water was used in order to approach natural conditions and allow of interference with the tests for *B. coli* by the water bacteria present. The tests were planned to show also any difference that might exist between dextrose broth and lactose bile in indicating *B. coli* when vigorous and when attenuated.

VIABILITY. The *B. coli* quickly died out in the samples kept at 37° C., lasting only eight to ten days. At 20° C. and 8° C. *B. coli* lived much longer, thirty-eight to seventy-five days at 20° C. and seventy-seven to eighty-four days at 8° C. It is important to know in regard to samples of water which have been necessarily some time in transit whether the test for *B. coli* is trustworthy as evidence of the presence and amount of pollution. The results indicated that samples shipped without ice, unless they should become considerably warmed in transit, may yield good evidence even if a week old.

BACTERIAL INTERFERENCE. In the first set of experiments the samples were plated daily in litmus-lactose-agar and in gelatine. The well water originally showed 12 bacteria per cc. on gelatine. These increased so that there was a maximum of 30,000 water bacteria at 37° C., 242,000 at 20° C., and 20,000 at 8° C. There were always thousands present. There was no very apparent relationship between the fluctuations of water bacteria and the tests for *B. coli*. Occasionally a sudden increase in the water bacteria was accompanied by a corresponding decrease in the test for *B. coli*. Before the *B. coli* had become attenuated, a comparison between the litmus-lactose-agar counts for *B. coli* and the dilutions showing gas formation in broth and bile showed that an average of 4 bacteria gave a test in dextrose broth and 39 in bile.

DEXTROSE BROTH. As a presumptive test for *B. coli*, dextrose broth has been limited to certain empirical rules, namely, gas production 25% to 70% and carbon dioxide 25% to 40%. Extended experiments have shown this test to be very unsatisfactory for several reasons.

1st. Several other species will give the formula.

2nd. Many other species produce gas in dextrose broth.

3rd. Other bacteria interfere with the test, causing numerous anomalies.

A striking feature of the above experiments was the complete failure of the formula in the presence of no other gas-former than *B. coli*. This was probably due to interference of the water bacteria. Out of 818 tests which showed gas formation, only 474 or 58% met the formula. Out of 259 sets of dilutions 76% showed anomalies.

Lactose Bile. In contrast to dextrose broth, the bile gave 599 positive tests for *B. coli*. Only three tests failed to show 25% gas, and each set of dilutions showed a consecutive series of positive tests.

The rapidity with which the gas appeared in the bile also gave some idea of the degree of attenuation of the *B. coli*.

For six days every test in the bile was positive in twenty-four hours. After the sixth day only two tests became positive in that time, on the eighth and on the twenty-fifth days.

On the ninth day occurred the first test that required three days to develop and that was the highest dilution of a test.

On the thirty-first and thirty-eighth days occurred the three tests which failed to show 25% gas in three days.

Comparative Delicacy. Generally speaking, the dextrose broth showed gas formation one dilution higher than did the bile. This was due to the inhibitive action of the bile salts, since lactose broth showed gas in as high dilution as did dextrose broth.

Rejuvenation Tests. Toward the end of these experiments, while the *B. coli* was attenuated, additional comparisons were made by planting dilutions into plain broth and transplanting into lactose bile at the end of twenty-four hours. Again comparisons were made using dextrose broth made with fresh beef infusion, instead of Liebig's extract.

The results were that rejuvenation in plain broth gave a test on an average 1¼ dilution higher than lactose bile, ¼ dilution higher than dextrose broth (Liebig's extract), and 1-10 dilution less than dextrose broth (fresh beef infusion). It is apparent

that the difference between plain broth and dextrose broth was due to the presence and absence of fresh meat infusion.

Hence, by planting dilutions of water into dextrose broth made with meat infusion, and as soon as gas appears, transplanting into lactose bile a larger number of tests for *B. coli* may be obtained than by using lactose bile alone. This excess *B. coli* is usually, however, attenuated and of less importance than vigorous *B. coli* which indicates fresh contamination.

Experiments with Routine Samples of Water Under Natural Conditions.

The previous experiments were conceived for the purpose of keeping strict control over all conditions with an exact knowledge of the gas-former present. Although the samples were unsterilized, thus allowing of the presence of large numbers of water bacteria, yet the experiments could not fail to be artificial in character.

In order to supplement and test under a wider range of natural conditions the information gained, daily comparisons were made upon Manhattan and Brooklyn waters between dextrose broth and lactose bile in one year and between lactose bile, lactose bile with peptone, and dextrose broth transplanted to lactose bile with peptone, in another year, during the seasons when *B. coli* is prevalent.

It had been learned between the two series of tests that the addition of peptone to the bile hastened the production of gas and increased its quantity, rendering the test considerably more delicate.

The first year's tests show somewhat more tests by the formula in dextrose broth in the higher dilutions than by the lactose bile. There were also present an enormous number of bacteria which produce gas in dextrose but not in lactose. There is certainly much greater interference with proper gas formation in dextrose broth than in lactose bile as shown by 175 anomalies in the former against 21 in the latter.

The second year's comparisons give a better idea of the true relative value of the test media, since transplating to bile established very closely the actual amount of *B. coli* present. The following table gives the number and percentages of positive

tests for *B. coli* obtained by the different media, and also in the last column of total gas-formers present.

		Dextrose broth. (formula)	Lactose bile.	Lactose bile with peptone	Dextrose broth 5% gas and over, transplanted to bile.	Duplicate bile tests.	Dextrose broth 5% gas & over
Manhattan	0.1 cc.	0– 0.0%	1– 1.2%	1– 1.2%	0– 0.0%	2– 2.4%	0– 0.0%
supply.	1.0 cc.	6– 7.1%	5– 5.9%	13–15.4%	4– 4.7%	15–17.7%	14–16.5%
85 tests.	10.0 cc.	24–28.2%	31–36.5%	54–63.5%	48–56.5%	60–70.6%	59–69.4%
Brooklyn	0.1 cc.	1– 0.6%	1– 0.6%	1– 0.6%	2– 1.3%	2– 1.3%	15– 9.4%
Supply.	1.0 cc.	11– 6.9%	15– 9.4%	25–15.6%	25–15.6%	31–19.4%	62–38.8%
160 tests.	10.0 cc.	51–31.9%	63–39.4%	72–45.0%	93–58.1%	88–55.0%	121–75.6%
Total.	0.1 cc.	1– 0.4%	2– 0.8%	2– 0.8%	2– 0.8%	4– 1.7%	15– 6.3%
	1.0 cc.	17– 7.0%	20– 8.2%	38–15.5%	29–12.0%	46–18.8%	76–31.4%
245 tests.	10.0 cc.	75–30.7%	94–38.4%	126–51.2%	141–57.6%	148–60.4%	180–73.5%

The first two columns show no very great difference between the lactose bile and the dextrose broth formula, there being a slight advantage for the bile.

The second and third columns illustrate the great improvement caused by adding peptone to the lactose bile.

The third, fourth and fifth columns prove that the lactose bile with peptone produces in practice substantially the same results as rejuvenation in dextrose broth, made with Liebig's extract, combined with transplanting to bile. With Manhattan water the bile decidedly had the advantage.

The last column shows that an excess of gas-formers, not *B. coli*, may be present in water of good quality.

In the experiments conducted under artificial conditions the number of formula tests for *B. coli* was 58% of the number of tests showing gas formation. In the above table it is interesting to note that the number of formula tests is 54% of the number of tests for *B. coli* shown in dextrose broth by gas formation corroborated by transplanting to bile.

Rejuvenation. About sixty rejuvenation tests were also made on these waters, planting in plain broth and transplanting to bile. Rejuvenation in plain broth showed a slight advantage on the Brooklyn water.

The same samples were also used in a comparison between gas formation in dextrose broth, made with Liebig's extract, before and after rejuvenation in plain broth. There was con-

siderable improvement after rejuvenation, showing the necessity for fresh beef infusion in dextrose broth, as previously indicated.

TRANSPLANTING. Rather uncertain results may sometimes follow transplanting, so that as a routine procedure it is not to be highly recommended. This is due partly to bacterial interference and largely to errors of inoculation. A study of 360 transplantings showed among other things that a formula test in dextrose broth may be caused by some other germ than *B. coli* in quite a percentage of cases, and that transplanting may sometimes fail to show *B. coli* although present. Several times, transplanting to bile brought up a test when originally no gas had appeared.

CONCLUSIONS.

1. Experiments conducted under carefully regulated conditions have shown that the bile salts in lactose bile cause an appreciable degree of inhibition in the development of *B. coli*.

2. This inhibition increases with attenuation.

3. Rejuvenation in suitable media followed by transplanting to lactose bile will sometimes prove the presence of *B. coli*, usually attenuated, not shown by lactose bile in direct tests.

4. In actual practice covering hundreds of samples of Manhattan and Brooklyn waters, the lactose bile, made with the addition of one per cent. peptone, has been shown to practically equal the results obtained by rejuvenation in dextrose broth, made with Liebig's extract, followed by transplanting to lactose bile.

5. If dextrose broth is continued in use, it should be made with fresh beef infusion, since it is then more delicate than when made with Liebig's extract. The formula test is of but little practical value and transplanting to lactose bile should be made as soon as gas appears.

6. Gas formation in lactose bile after transplanting from the plain broth or dextrose broth is not always certain, even when *B. coli* is present, on account of interfering growths in the original medium.

7. Lactose bile gives more reliable presumptive tests for *B. coli* than any other known medium, including Aesculin broth.

8. Other species of bacteria cause much less interference with gas formation of *B. coli* in lactose bile than in other media.

9. To rejuvenate and transplant seems too laborious and uncertain in routine work. The information gained assists more especially in interpreting the results obtained with lactose bile. Lactose bile makes a distinction between recent and distant contamination, hence gives better evidence of the actual relative sanitary quality of a water.

10. The use of lactose bile as a step in the separation of *B. typhosus* from water adds yet weightier reasons for its direct employment in the examination of water.

Mt. Prospect Laboratory, Brooklyn, N. Y.

CONTRIBUTION TO THE MICROSCOPICAL INVESTIGATION OF *HAEMATOZOON MALARIAE*.*

By OCTAVIANO GONZALEZ-FABELA,
Mexico City, Mexico.

Everyone in charge of the free service of bacteriological diagnosis, in Boards of Health laboratories, has experienced difficulties in carrying out the different technical manipulations, on account of the more or less imperfect sampling at the bedside by the practicing physicians. Referring to paludism those imperfections may consist in the want of cleanliness, the use of too strong antiseptics, or slowness in the process.

The method most generally in use in sending to laboratories the blood suspected of paludism, is to send films on cover-glasses or slides, in order to make stained preparations. I have noticed many times that films are very thick and the globules found completely deformed, on account of which the result may be doubtful, especially if found negative.

The examination of dry and stained blood is not, in my opinion, so accurate as the examination of fresh blood. The great number of methods of staining seems to point out that it is difficult to stain with absolute accuracy the different forms of haematozoon, and that no one method is perfect, just as the great number of drugs recommended against one disease seems to tell the small efficiency of all of them. So far as the coloring of the haematozoon is concerned, no stain is absolutely perfect or could be compared with the always exact result, which, for example, the Ziehl-Neelsen's stain gives with the Koch bacillus, now in use by everyone, with absolute reliability.

The forms of haematozoon which are found almost to the exclusion of the others in cases of malaria, often clinically suspicious of yellow fever, are the young forms, amoeboid, hyaline, intraglobular ones, and that is to say, the most difficult to stain even in films made by expert laboratory-workers. Those who have opportunity of examining frequently paludic blood have

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., Oct., 1909.

noticed that sometimes old forms of haematozoon and small intraglobular ones are seen in fresh blood, whilst in stained preparations of the same blood old forms are only to be seen. Hence if the examined blood contains only the small forms and a dry and stained preparation only be made, paludism may be overlooked and the case considered yellow fever, thus inflicting damage on the patient and a lot of trouble for the community. In view of these possible errors in staining, the examination of fresh blood should always be made in preference to staining. Everybody advises the observation to be made as soon as possible and many authors say that the examination of fresh blood ought to be made "if possible": I wish to emphasize that it is always possible to make this examination and it must always be made before the other.

The examining of fresh blood, besides avoiding the said inconveniences presents the following advantages: It allows the better appreciation of the condition of globules; it brings out the contrast between the small forms and proper pigment of haematozoon and the aspect of the normal globules; it also permits the recognition of their motility. Even more, in taking fresh blood, it can be preserved for some time, the haematozoon, however scarce it may be, will multiply, and will be found in greater number than at the moment the blood was drawn.

The advantages of staining just to show the structure of haematozoon must not be taken into consideration, if we have only in mind to make a diagnosis; the characters of haematozoon in fresh blood are typical enough to distinguish it. I have examined the blood of a patient in Veracruz, just out from the vessel, and repeated the examination in Mexico, 24 and 48 hours after, preserving the blood in a capillary pipette. The result of both observations supplied me with the following knowledge: At the bedside I found only a very few amoeboid, hyaline, intraglobular bodies, with pigment rather difficult to appreciate; in the observation in Mexico the same bodies were much more numerous, with plenty of pigmented grains in active motion; almost all intraglobular, and some of them already free in plasma; the globules were perfect in shape. The diagnosis, rather difficult at Veracruz on account of the very small number of

haematozoon, became easy in the later examinations. Afterwards I examined many samples of fresh blood sent to me from that port; I always found it in good condition for manipulating. At the same time I examined in the laboratory some blood, just taken, and repeated the examination of this blood eight days after. In both observations I found the old forms of the haematozoon, and plenty of pigment in very active motion.

To preserve blood I simply used a very small pipette, like Pasteur's, with a small bulb that might be filled with a drop less than five centigrams. I proceeded in the following manner: The finger is perfectly washed with water and soap, afterwards with alcohol, covering with sterilized cotton, waiting sufficient time so as not to leave any trace of alcohol; pricking. Whilst the blood flows the pipette is open, then we aspirate trying to fill the small bulb with a single aspiration so as to make the blood pass as rapidly as possible from the vessel into the pipette. When the bulb is completely full we close it in a lamp above and below the bulb, doing one's best not to leave any air enclosed. The blood taken in this condition arrives to the laboratory in perfect state; it is preserved during some time without coagulating and may be expelled on a slide by blowing through a thin india-rubber tube applied to the small bulb. When the blood is coagulated, a very small part of coagulum is pressed between a slide and a cover-glasses to obtain a fresh preparation; with another small portion of the coagulum one can make films thin enough for a good staining. As we see, the technic for taking and sending blood is a most simple one, well known by my learned and kind auditors, and much more easy to undertake than the preparations of a satisfactory film.

The ideal should be that in all cases of diagnosis performed by the laboratories, the worker himself should take the blood according to the technic that he may have most practiced and could best guarantee. As this is not possible, I suggest a procedure that reduces to the minimum number the manipulations recommended to practising physicians; these physicians, by reason of doing but little microscopical work, can never be so successful as those who daily practice it.

From what is said it may be concluded:

1st. For the diagnosis of paludism the observation of fresh blood is by far preferable to that of dry blood;

2nd. For diagnosis, in the Boards of Health, it would be advantageous if the transmission of suspected blood was made in the above described manner, instead of in films prepared by practicing physicians.

BACTERIOLOGICAL METHODS FOR AIR ANALYSIS.*

By JOHN WEINZIRL and MAUD V. FOS,
University of Washington, Seattle, Washington.

The appointment by the A. P. H. Association of a Committee on "Standard Methods for the Examination of Air" renders the present time especially appropriate for the testing out of the numerous bacteriological methods and devices which are now employed by investigators in this field. So numerous are the schemes employed that practically no two investigators use the same one, and as a result, it is quite impossible to estimate the accuracy and value of the data thus far obtained. Certainly a standard method is very much to be desired.

The present occasion is not a suitable one for the review of the numerous devices which have been employed or suggested for securing the bacteria contained in a definite volume of air, but it will prove helpful to group them for purposes of discussion. All the schemes naturally fall into three general methods, viz., (a) precipitation of the bacteria by gravity, (b) bubbling air through some liquid, and (c) filtering air through some granular solid.

THE PRECIPITATION METHOD.

The most perfect type of the precipitation method is probably that recently suggested by Winslow (Science, N. S. Vol. 28, p. 28) and designated as the bottle-plate method. Two litre-and-a-half bottles are connected in tandem by glass and rubber tubing, so that air may be drawn into the top of the first bottle, from the bottom of the first into the top of the second and out from the bottom of the second bottle.

On the bottom of each bottle is placed a layer of nutrient gelatin. A measured volume of air is drawn through the bottles by suction. Most of the bacteria are precipitated on the bottom of the first bottle, the remainder if any are caught in the second bottle.

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* Read before the Laboratory Section of the American Public Health Association at Richmond Va., October 1909.

It was hoped that this method would prove more accurate than others. Only a few trials were made by it and these revealed the following disadvantages: (1) Agar cannot well be substituted for the gelatin because of the formation of spreaders. (2) The apparatus is awkward to sterilize, and cumbersome for field determinations, especially when considerable numbers are to be made. These disadvantages are sufficiently serious to preclude its general adoption by analysts.

THE BUBBLING METHOD.

The bubbling method has been employed by some investigators, notably by Miquel of France, who made his long series of observations by means of it. The writers attempted to simplify the apparatus for this method so that it could readily be set up in any laboratory. For this purpose a couple of Naples jars were connected in tandem much the same as Winslow's bottle plates. The tubes entering the jars reached within a centimeter of the bottom and were drawn out to 2 mm. to give small bubbles. The air was drawn through normal salt solution to which a drop of oil was added to prevent frothing. There is no essential difference between this and Miquel's apparatus.

TABLE I. Giving Results by the Bubbling Method.

No.	Amount of water used (c. c.)	Aspiration rate (l. per min)	Bacteria per litre	Per cent carried to 2nd bottle	Bacteria caught in 2nd bottle	Colonies per plate
1	10	1.33	1600	2.5	320	32
2	10	1.33	668	2.2	120	12
3	10	1.14	312	1.2	40	4
4	10	0.26	57.5	19.5	90	9
5	20	1.33	268	5.5	120	6
6	20	0.9	51.2	21.8	90	4.5
7	30	1.0	397	6.6	210	7
8	40	....	....	1.1	60	1.5
9	40	....	....	10.0	680	17
10	40	....	....	7.0	120	3
11	40	....	....	0.6	80	2

Many trials were made by this method, but most of them were qualitative and have been omitted from Table I. If the percentages carried through to the second bottle are considered, the results appear unsatisfactory. If, however, the numbers of

colonies which appear on the plates are also taken into account and allowances made for contamination, then the results appear fairly satisfactory. It was found that when the depth of the water in the first jar was increased, fewer bacteria escaped into the second. However, the method is cumbersome and quite as inconvenient for field work as the bottle-plate method. Inasmuch as we have a more satisfactory method, it would seem that this one might well be dropped by all analysts.

FILTRATION METHODS.

A considerable number of filtering materials have been used or proposed. These materials fall into two classes, (a) soluble, and (b) insoluble. Theoretically, the soluble filter is ideal, since no grains remain to interfere, during the manipulations or in counting the colonies. A number of substances such as sugar, sodium sulphate and common salt were tried but all exert more or less of an inhibitive influence on the development of the colonies and their use should be abandoned. Apparently the search for a satisfactory soluble filter is hopeless, because the inorganic compounds are inhibitive and the organic, if not inhibitive, either melt or char badly.

Of the insoluble filter substances sand has been most commonly employed. The effectiveness of sand to retain the bacteria appears to have been questioned, the idea being that channels formed through which they escaped. Accordingly, comparative tests were made with the following: (a) Sand passing 100 mesh sieve and 2.5 cm. deep; (b) ditto, 1 cm. deep; (c) ditto 0.5 cm. deep; (d) Sand passing 150 mesh sieve and 1 cm. deep; (e) sand 100 mesh mixed with one-fourth part powdered silica; and 1 cm. deep; (f) ditto with one-tenth silica.

Numerous tests with these and other substances were made but all the results are omitted excepting one comparative set run at the close of the work with a constant technique; this set is given in Table II. The filters were set up after the specifications recently published by Winslow, i. e., glass tubes 10 c.m long and 1 cm. in diameter were connected in tandem by means of glass tubes but substituting corks for the rubber stoppers as better suited for sterilization. The sand was held on the corks by means of bolting cloth, and all connections were carefully

wired. The air was charged with dust in order to diminish the volume of air that must be drawn through the filter and still get a reasonable count, and also to give the filter as severe a test as possible.

TABLE II. GIVING RESULTS BY THE SAND FILTER METHOD.

No.	Kind of Filter	Depth of Filter (cm.)	Rate of Filtration I per min.	Bacteria per litre	Bacteria caught in 2nd filter	Percent carried thru first filter
1	Sand 100 mesh	2.5	1.9	50	8	2.0
2	"	"	1.6	25	0	0.0
3	"	"	1.9	21	4	2.4
4	"	"	1.9	68	6	1.1
5	"	"	1.8	18	0	0.0
6	"	"	1.9	8	0	0.0
7	"	1.0	1.2	531	3	0.08
8	"	"	"	158	8	0.6
9	"	"	"	184	6	0.4
10	"	"	"	34	0	0.0
11	"	"	"	199	1	0.6
12	"	0.5	1.2	90	15	2.2
13	"	"	"	12	3	2.5
14	"	"	"	225	19	8.4
15	"	"	1.0	176	3	0.2
16	"	"	1.2	300	12	0.3
17	"	"	"	43	3	0.7
18	"	"	"	57	6	1.4
19	Mesh 150	1.0	1.7	21	1	0.7
20	"	"	2.1	34	6	2.3
21	"	"	1.9	142	7	0.7
22	"	"	2.4	29	11	4.8
23	"	"	2.2	67	1	0.2
24	"	"	2.5	14	1	1.0
25	Silica(3:1)	"	....	31	6	2.4
26	"	"	2.0	9	5	6.8
27	"	"	2.5	35	5	1.7
28	"	"	1.7	30	5	2.0
29	"	"	1.5	30	4	1.6
30	"	"	2.2	66	2	3.8
31	"	"	2.1	11	0	0.0
32	Silica (9:1)	"	1.7	42	4	1.2
33	"	"	2.1	51	5	1.2
34	"	"	2.1	154	1	0.1
35	"	"	....	135	5	0.4
36	"	"	1.5	112	1	0.1
37	"	"	2.1	2	0	0.0

The percents carried through the first filter are variable and do not give a satisfactory clue to understanding the efficacy of the method. Accordingly the number of bacteria caught in

the second filter is also given in the table. An inspection of this column shows that most of the counts fall within the limits of experimental error due to contamination. All the results, save perhaps those with sand one-half centimeter deep, are satisfactory, and it is only in rare instances when the bacteria actually pass through the first filter.

Incidentally the greatest weakness of the method was revealed. In the pouring of the sand from the tubes to the diluting solution, pipetting off an aliquot portion, and pouring the plate, a slight contamination is apt to occur. This contamination is negligible when large volumes of air are filtered, or when the air is highly charged with bacteria; if, however, the reverse of these conditions obtain, then the contamination factor is so serious as to completely invalidate the results. This determines that much larger volumes of air must be filtered than has usually been done heretofore. For this purpose an aspirator of the continuous type is much the most convenient and is best adapted for field work. A bicycle pump may not be used as a means of aspirating the air because the amount delivered depends upon too many variables to be accurately standardized.

In making plates from the sand filters the writers prefer to use the following technique: The sand of the first filter is poured into 10 cc. of sterile normal salt solution contained in a 100 cc. flask and shaken twenty-five times, after which alliquot portions, one to five cc. are plated so as to secure a fair count which, however, should not exceed 200 colonies for a 9 cm. plate. When the colonies are too numerous, inhibition results, and when too few the error becomes too large and renders the work well-nigh useless.

In plating the control filter, the sand is added to 5 c. c. sterile salt solution, and shaken as before. All the water is drained into the petri dish leaving most of the sand behind, thus giving a fair plate. The amount of water plated is quite constant and readily determined. In this way the larger error due to a large multiplication factor is avoided.

Agar made up according to the standard methods for water analysis but with a reaction of +0.5 is preferred. The plates are incubated at room temperature for not less than five days. Incubation at 37° C. reduces the count by more than one-half.

For field work, large numbers of sand filters may be constructed and kept in a suitable case. A continuous aspirator renders the work easier and makes the collector quite independent as to his field of operation.

SUMMARY.

If in adopting a standard method the selection is governed by (a) accuracy; (b) general applicability and (c) simplicity, then the sand filtration method meets the requirements more completely than the other methods. It is necessary, however, to filter large volumes of air and for this purpose a continuous type of aspirator is best adapted. The addition of ten per cent. of silica helps to diminish the size of spaces between the sand particles and renders the filter even more certain.

LONGEVITY OF B. DIPHTHERIAE ON SWABS.

By FRANCIS H. SLACK, B. L. ARMS and E. M. WADE,
Boston Board of Health Bacteriological Laboratory.

In connection with the work for the A. P. H. A. Committee on Standard Methods for the Bacterial Examination of Diphtheria, the staff of the Boston Board of Health Laboratory undertook to conduct an investigation as to the longevity of diphtheria bacilli on swabs, it being especially desirable to ascertain how long swabs of the different kinds could be kept after being taken before inoculating on serum without vitiating the results.

In connection with this work a series of tests was also made comparing duplicate serum cultures made with the same swab, in one of which the swab was left during incubation to see if its presence would have any adverse effect on the organisms, since it had been frequently noticed that no growth or scanty growth was found in routine cultures where the swab (contrary to instructions) had been left on the serum by the physician.

We are indebted to Dr. E. H. Place, of the Contagious Department of the Boston City Hospital, who took swabs for this work from known cases of diphtheria in the early stages of the disease. These swabs were of course tipped with non absorbent cotton as is the custom. Usually fifteen swabs were taken at one time from each case, (equally divided between iron, brass and wood) thus allowing a serum inoculation of each on the day they were taken and for four successive days thereafter, the swabs being kept in tubes in the dark until inoculated.

In order to test whether the metal swabs exerted any germicidal action, a duplicate serum was inoculated each time and swab left on it during incubation.

All cultures were incubated for 15 hours at 37° C. after which smears were made in the usual manner and stained with Loefflers methylene blue.

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Considering these cultures as for diagnosis the smears were then examined by each of us separately, one examining the upper portion, one the centre and one the lower portion of each smear, and the results recorded whether positive, negative, suspicious or no growth, together with the types of diphtheria bacilli found (according to Wesbrook) just as is done in the routine diagnostic work of the laboratory, our records being carefully kept from each other until a series was completed when they were impartially compared and a fair adjustment made of any points where the agreement was not perfect.

On questions of diagnosis the difference of opinion was slight, occasionally for example, two would regard a culture as positive which another would report as very suspicious or vice versa. In such cases the report was given as the majority ruled.

On types slight differences of opinion were frequent and only those types were recorded on which at least two agreed.

Of the 26 cases from which swabs were taken, two were negative throughout, leaving 24 cases where positives were obtained, on one of these cases brass swabs were not taken and on another inoculations of wood swabs were omitted on the fourth day, each of these omissions being due to there not being sufficient swabs at the hospital for the full number.

From the six inoculations made daily in each of these 24 cases we would have been justified in calling but 15 cases positive on the first day, 19 the second, 23 the third, 24 the fourth and 21 the fifth. It will be noticed that positives were obtained on all these cases on the fourth day only, notwithstanding that through an error two cultures were omitted on this day.

The results of the work may be summed up as follows. Six inoculations each day on 24 cases less two on brass swabs, or 142 daily inoculations.

TABLE No. I.

	1st day	2nd day	3rd day	*4th day	5th day
Positive	55	83	94	98	93
Negative	66	10	9	11	7
Suspicious	21	49	35	26	36
No Growth	0	0	4	5	6

* Two not made on wood.

From this table it will be seen that constantly better results were obtained up to the fourth day and even the fifth day ranks very close to the third. On the first day nearly one half of these swabs from positive cases gave strictly negative results, this being reduced to less than one-thirteenth with negative results on the fourth day.

Beginning with the third day a few no growth results are obtained.

TABLE No. II.

	Positive	Suspicious	Negative	No Growth	Total
First Day—					
Iron	7	6	11	0	24
With Swab	8	6	10	0	24
Brass	7	4	12	0	23*
With Swab	7	4	12	0	23*
Wood	13	1	10	0	24
With Swab	13	0	11	0	24
Second Day—					
Iron	15	3	6	0	24
Swab	16	2	6	0	24
Brass	13	2	8	0	23*
Swab	15	0	8	0	23*
Wood	11	2	11	0	24
Swab	13	0	11	0	24
Third Day—					
Iron	18	1	3	2	24
Swab	16	2	5	1	24
Brass	16	1	6	0	23*
Swab	14	3	6	0	23*
Wood	15	1	7	1	24
Swab	15	1	8	0	24
Fourth Day—					
Iron	18	1	4	1	24
Swab	20	1	2	1	24
Brass	16	3	3	1	23*
Swab	15	2	6	0	23*
Wood	14	2	6	1	23*
Swab	15	2	5	1	23*
Fifth Day—					
Iron	18	0	5	1	24
Swab	16	3	5	0	24
Brass	16	0	7	0	23*
Swab	18	1	4	0	23*
Wood	12	2	7	3	24
Swab	13	1	8	2	24

* Not taken on one case.

The results with the different materials used for swabs and the standing of tubes with swabs left in as contrasted with those without is shown in Table No. 2.

Thus it is seen that on the first day wood gives much the better results. On the second, third and fourth days iron stands first, brass second and wood third while on the fifth day brass and iron are about equal with wood far inferior.

The tubes with swabs in ran very consistently with those without the results being very slightly in their favor.

The method of taking the swabs should be considered in relation to these findings. In order to make the operation of taking the cultures as unobjectionable as possible to the patient, the five swabs of a kind were all taken at one operation, then thoroughly rubbed together. The cases may be divided into two series according to the way these swabs were taken.

Series 1. 10 cases taken with iron, brass and wood swabs in order named.

	Positive	Suspicious	Negative	No Growth
First Day—				
Iron........	2	4	4	0
With Swab..	3	3	4	0
Brass.......	3	2	5	0
With Swab..	2	3	5	0
Wood.......	8	0	2	0
With Swab..	7	0	3	0
Second Day—				
Iron........	9	1	0	0
Swab.......	10	0	0	0
Brass.......	7	1	2	0
Swab.......	7	0	3	0
Wood.......	5	2	3	0
Swab.......	7	1	2	0
Third Day—				
Iron........	10	0	0	0
Swab.......	9	1	0	0
Brass.......	7	0	3	0
Swab.......	7	0	3	0
Wood.......	7	0	2	1
Swab.......	8	1	1	0
Fourth Day—				
Iron........	9	0	1	0
Swab.......	9	1	0	0
Brass.......	6	1	2	1
Swab.......	6	1	3	0
Wood.......	8	1	0	1
Swab.......	9	0	1	0
Fifth Day—				
Iron........	9	1	0	0
Swab.......	8	1	1	0
Brass.......	8	2	0	0
Swab.......	9	0	1	0
Wood.......	9	1	0	0
Swab.......	7	2	1	0

Wood stands best on the first day, iron the second, third and fourth, though wood nearly equals it the fourth. On the fifth day results from all are practically the same, wood ranking slightly lower than the others. A summary of these figures shows on the average that iron gave the best results, wood second and brass the poorest.

Series 2. 13 cases taken with wood, brass and iron swabs in the order named.

	Positive	Suspicious	Negative	No Growth
First Day—				
Iron........	4	2	7	0
Swab.......	4	3	6	0
Brass.......	4	2	7	0
Swab.......	5	1	7	0
Wood.......	4	1	8	0
Swab.......	5	0	8	0
Second Day—				
Iron........	6	2	5	0
Swab.......	6	2	5	0
Brass.......	6	1	6	0
Swab.......	8	0	5	0
Wood.......	5	0	8	0
Swab.......	5	0	8	0
Third Day—				
Iron........	8	1	2	2
Swab.......	7	0	5	1
Brass.......	9	1	3	0
Swab.......	7	3	3	0
Wood.......	7	1	5	0
Swab.......	6	0	7	0
Fourth Day—				
Iron........	9	1	2	1
Swab.......	10	0	2	1
Brass.......	10	2	1	0
Swab.......	9	1	3	0
Wood*.....	6	1	5	1
Swab*	5	2	4	1
Fifth Day—				
Iron........	8	0	4	1
Swab.......	7	3	3	0
Brass.......	8	0	5	0
Swab.......	9	0	4	0
Wood.......	4	1	5	3
Swab.......	5	0	6	2

* One case omitted.

Results show brass is best with iron very nearly equalling it and wood the poorest. On the first day results are fairly equal on all three.

In all this work the tubes with swabs left in give if anything slightly better results than the others. No growth results in such tubes in routine practice were probably due to the error of

the physicians in putting such swabs in without carefully inoculating the serum under the impression that the presence of the swab in contact with the serum was sufficient. In many such cases the serum was broken where the swab had been thrust into it leaving the surface uninoculated.

TYPES. It was noticeable not only that more positive results were obtained from the older swabs but also that the types of bacilli were better and the cultures more nearly pure.

Smears showing nothing but diphtheria bacilli under the microscope from the 142 inoculations made each day were observed in six instances on the first day (all from one case) four the second, one the third, seventeen the fourth and 26 the fifth, this being in the nature of very strong proof that the many negatives from inoculations made the first day were due to the overgrowth of diphtheria bacilli by the ordinary throat organisms which were unable to resist the drying on swabs as long as did diphtheria. A method of isolating diphtheria bacilli might be based on these findings.

It will be remembered that positives results were obtained the first day on but fifteen cases. These cases have been chosen to show the standing in regard to types on the various days of the different swab materials.

RELATIVE STANDING AS TO TYPES.

This table from the fifteen cases positive on the first day has been calculated from the comparative marks given each smear in a series as it was examined. The lower the number, the higher the standing, i. e. if Iron for instance stood first in the fifteen examinations of one day, the rating would be 15; if it stood first 10 times and second 5, the rating would be 20 or 10 x 1 plus 5 x 2.

	1st day	2nd day	3rd day	4th day	5th day
Iron..................	44	43	41	33	40
Iron Swabs............	45	40	42	34	40
Brass..................	42	41	40	42	34
Brass Swabs...........	46	37	38	39	37
Wood..................	31	42	47	36*	36
Wood Swabs...........	28	34	38	34*	31

* One not taken.

On types wood stands first on the first, second and fifth days, brass on the third and iron on the fourth.

It must be borne in mind that these results were obtained from swabs taken fifteen from one patient at a visit. A single swab gathering more material would probably give more positive results from the immediate inoculations. In any event the advantage of an early diagnosis in this disease is so great as to discount any delay in the cultural methods.

From the work done we draw the following conclusions:

1. For ordinary cultural work where the serum is to be inoculated immediately after the swab is taken wooden swab sticks give the best results both in the number of positives obtained and the excellence of the types.

2. If inoculation is to be delayed a day or two, as might be the case where swabs only are sent out from State laboratories to be inoculated on return to the laboratory, better results will be obtained from iron swabs.

3. The results obtained indicate that with the ordinary cultural methods, negative laboratory results on positive cases either for diagnosis or release may often be due to overgrowth by ordinary throat organisms.

4. The adoption of the method of sending swabs only from the laboratory to be inoculated on return to same, would in state laboratories, where such swabs might be a day or two in transit, result in more accurate diagnosis than is possible where immediate inoculations are made, and incidently cases would probably be held longer in quarantine.

5. Leaving the swabs on the serum after inoculations has no adverse effect on the results when the culture is properly made.

A STANDARD FUMIGATING OUTFIT FOR A SINGLE ROOM.

By ALLEN W. FREEMAN, M. D.,
Assistant Commissioner of Health of Virginia.

Every one doing public health work involving rural communities comes to feel the need of some reliable and cheap method of fumigation for houses and rooms in the small towns and open country. However little value one may attach to fumigation in itself, the time is not yet ripe to abandon it altogether, and while it is being used it should by all means be made as efficient as possible.

The results of the work of Rosenau and Anderson, and of Hill leave little doubt as to the fact that the Formalin and Permanganate method is the most reliable method in common use, and in the outfit here described the effort is made to make this method available for general use by persons of average intelligence.

The outfit, briefly, consists of a fourteen quart galvanized pail, in which are packed the articles necessary for the generation of the gas and the sealing of the room. The contents consist of:

A bottle containing 11 ounces of Formalin diluted with 9 ounces of water.

A bottle containing 11 ounces of Permanganate of Potash.

A roll containing fifty feet of gummed fumigating paper, wrapped in waxed paper.

Directions for use.

The bottles with the fumigating paper are packed in excelsior in the pail, the directions are placed on top, and over the top of the pail is then tied a sheet of heavy waxed paper and a sheet of ordinary unbleached muslin. The package can then be shipped by express or freight without danger of breakage.

In operation all that is necessary for the fumigation of a room is to unpack the pail, seal the cracks with the paper, set

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the pail in the middle of the room, empty the permanganate into the bottom, pour over the formaldehyde and leave the room. Every thing needed is at hand.

Allowing a small margin for labor, labels, excelsior and the like, the outfit can be supplied at a cost of 40 cents each. Where two rooms are to be fumigated the materials can be put into one bucket at a cost of about 65 cents for the two rooms.

There has been considerable demand for the outfits as supplied by the Virginia State Department of Health and they have given apparent satisfaction, and solved an otherwise difficult problem. They are supplied to any citizen of the State at cost, carriage to be paid by the purchaser. The outfit packed for shipment weighs about 7 pounds.

IMPORTANCE OF STANDARD METHODS FOR TESTING DISINFECTANTS.

By WILLIAM DREYFUS,
New York City.

In 1884 this Association at the Annual Meeting in St. Louis, appointed a Committee to examine into the subject of disinfectants, antiseptics and germicides in their relations to preventive medicine and sanitation. This committee reported its findings a year later at Washington and again in 1887, and 1888; the whole report appeared in book form and constitutes a most valuable addition to the literature on the general subject.

Since those days both chemical and sanitary science have made marvelous progress and the use of disinfectants has become more and more general, but owing to the fact that the market today is flooded with a number of worthless preparations, a slight reaction, or rather conservatism, has set in of late.

If, however, we consider the quantities of disinfectants used by the Government Departments, Hospitals, Railroad and Steamship Companies, Private and Public Institutions and private individuals, one can readily realize that the production, distribution and application of chemical disinfectants represents quite a large industry.

There is no doubt that the judicious use of good chemical disinfectants is a great and valuable means of fighting or even preventing disease, and on this account we should have a reliable method for estimating the value of all substances used as germicides. I would even urge that all disinfectants sold as such, should have the manufacturer's guarantee as to bacteriological efficiency, printed on package and label, which could be checked by testing.

Unquestionably, such products as Carbolic Acid, Corrosive Sublimate, Permanganate of Potash, Formaldehyde etc., which are of definite chemical composition and answer to well-known chemical tests, could readily be examined by chemical means.

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In the course of time, however, the substances used as disinfectants have become more and more complicated. Chemists have vied with each other in attempting to mix the most varied substances in the hope of producing the ideal disinfectant, until a point has been reached where the analytical chemist finds himself practically defeated and unable to determine the constituent parts of the mixture. Moreover, should he be successful, it avails him little, for the germicidal properties of a mixed disinfectant depend quite as much on physical conditions in manufacture as on the chemical composition. It was found that a disinfectant containing 10% of Cresols in emulsion was equal in bacteriological power to one containing 30% in solution when tested against *bacillus typhosus*. Chemical analysis is, therefore, in the majority of cases, out of the question, and is in no way necessary, since, as disinfectants are intended for the destruction of germs of specific diseases, it has long been recognized that the only satisfactory method of judging the value of a substance which is to be used for this purpose is by measuring the actual quantity that is required to kill some given organisms under certain fixed conditions.

Every conscientious manufacturer is endeavoring, both as a matter of self-interest as well as public duty, to have the merits of his products established by proper bacteriological examination. However, an experience, extending over a period of many years, both abroad and in this country, in the manufacture of chemical disinfectants, has brought to my notice many extraordinary discrepancies in the opinions reached by various bacteriologists of standing, as to the relative values of disinfectants.

To give you a concrete example of the different estimates which may be formed of a disinfectant by various observers, let me quote a recent case of Disinfectant "A." One observer finds that a dilution of 1:2300 acting for five minutes on *B. typhosus* kills the organism, while 1:122 Pure Carbolic Acid is required to kill the same *B. Typhosus* in the same time. Another observer finds that this disinfectant "A" 1:400 kills *S aphylococcus Pyogenes Aureus* in 2½ minutes, whereas it took pure Carbolic 1:40 to kill the same organism in the same time, yet the relative resistance of these two organisms does not warrant such a wide range of results when carried out under the same conditions for this same disinfectant "A." Similar cases of widely different results may be found recorded for almost every well-known disinfectant.

Such discrepancies are due to the fact that in the absence of any recognized, uniform method, each investigator selects

different methods, different organisms and different standards of comparison.

Abroad, and especially in Great Britain and Germany, they have made much further strides in standardization than we have over here, and on a visit there last spring for the purpose of investigating this subject, I had the opportunity of convincing myself of this fact, by personal observation in the field and by interviews with leading scientists.

A very short historical review of the development of bacteriological methods might not be out of place.

As far back as 1750 Pringle in Philo. Trans. published his first observations on Substances Resisting Putrefaction and Bucholz in 1875 and Jalan de la Croix in 1881 made extensive experiments with a great variety of reputed disinfectants, using an infusion of tobacco leaves and broth made from meat containing the organisms naturally occurring therein. It was not until Koch in 1881 published his Thread Method that pure cultures of bacteria were used. This method, however, was strongly criticised by Geppert and Gruber in view of the unavoidable carrying over of traces of disinfectant.

In 1875 Kronig & Paul published in Zeitsch f. Hygiene their Garnet method which has none of the drawbacks of Koch's thread method and they were the first to realize that the relative value of disinfectants depends very largely upon the conditions under which they work. Their method, however, has not come into prominence.

Rideal and Walker in 1903 before the Royal Sanitary Institute of Great Britain, Journal of the R. S. I. v. 24, October, 1903, described for the first time their method, which is known to-day as the "drop method." This has received recognition as a simple and relatively accurate method of establishing a standard comparison in the study of germicidal values. *B. Typhosus* is taken as the standard organism and Pure Carbolic Acid Crystals as the standard control and the strength of efficiency of the disinfectant tested is expressed in multiples of the latter and is called the "Carbolic Acid Coefficient."

A nutrient broth made from meat-extract is used for the culture of the test organism, and from the cultivation of the organism after exposure to the disinfectant, and the reaction of +1.5 adopted by this Association in 1898 was found the best for general work and used by the authors.

The principal factors of the Rideal-Walker method are the following:

1. Time.
2. Age of culture.
3. Choice of Medium. Reaction of same.
4. Temperature of Incubation.
5. Temperature of Medication.
6. Variations in vital resistance of same species.
7. Variations in vital resistance of different species.
8. Proportion of culture to disinfectant.

It would be too lengthy to enter into the details of these various factors, but it may be of interest to refer to the various investigations and researches which have been done since, and therefore I mention the following list of literature on the subject.

1. Rideal and Walker (1903). The Standardisation of Disinfectants. Journ. of the Roy. San. Inst. vol. XXIV, p. 424.

2. Firth and MacFadyen (1906). Report of the Disinfectant Standardisation Committee. Journ. of Roy. Sanitary Inst. Vol. XXVII p. 17.

3. Kenwood and Hewlett (1906). Some Observations upon the Practical Standardisation of Disinfectants. Journ. of the Roy. San. Inst. vol. XXVII p. 1.

4. Somerville and Walker (1906) 1. The Rideal-Walker Method of Standardising Disinfectants. Public Health, March, 1906.

——, (1906) II. Standardisation of Disinfectants, Public Health, May, p. 526.

——, (1906) III. Note on the Standardisation of Disinfectants in the Presence of Organic Matter. Sanitary Record. Nov. 29, 1906.

——, (1907). The Standardisation of Disinfectants in the presence of Organic Matter. Sanitary Record, May 9th, 1907.

5. Blyth, Wynter (1906). The Standardisation of Disinfectants. Analyst, May, '06, Journ. Sec. Chem. Industry, vol. XXV. Dec., '06.

6. Chick and Martin (1908). The Principles Involved in the Standardization of Disinfectants and the Influence of Organic Matter upon Germicidal Value. Journ. of Hygiene, vol. 8, No. 5, p. 654. Nov., 1908.

7. William Partridge, F. I. C., The Bacteriological Examination of Disinfectants, a little book of great assistance to every investigator in bacteriological examinations.

The Rideal-Walker method has been recommended for general purposes by the Disinfectant Standardizing Committee of the Royal San. Inst. and today Government Departments, Municipal councils and other large bodies in Great Britain and the colonies, are purchasing their disinfectants on the Rideal-Walker coefficient.

The following are two copies of tender forms used in England:

War-Office—

> "The contractor guarantees that tested against *B. Typhosus*, taking carbolic acid as the unit, the (Disinfectant tendered for) will give a coefficient of not less than ——— (the contractor to insert coefficient."

Municipal Borough of Islington—

> "Any disinfectant fluid may be tendered for provided that its bacteriological efficiency is expressed in terms of absolute phenol (100 per cent.) as determined by the Rideal-Walker method, when working with vigorous cultures of *B. Typhosus*, and that is miscible with water. The coefficient must be given in the blank space left for the purpose."

It is not expected that by a standard bacteriological test in the Laboratory we can determine the efficiency of any product for all classes of work, but some modifications for the determination of special efficiency in certain directions and for certain classes of work may be used to advantage. For instance I know a case where the Borough of Portsmouth, England, required some disinfectants for sewage treatment and in writing out their specification, stipulated that the disinfectant should have a

certain coefficiency when tested in presence of that sewage material. However, the Rideal-Walker method gives us a reliable opinion of the relative value of the commercial disinfectants sold on the market and I quote from the report of Dr. Sternberg, Chairman of the Committee on Disinfectants of this Association in 1884, as follows:

"As a matter of fact, these agents which by laboratory experiments have been proved to be the most potent germicides, have, by the experience of sanitarians, by tests upon vaccine virus, septicaemic blood, etc., been shown to be the most reliable disinfectants."

This is the information we seek and only a standard method for testing disinfectants will help us towards that goal.

AN ANALYTICAL AND EPIDEMIOLOGICAL STUDY OF FARM WATER SUPPLIES. *

By KARL F. KELLERMAN,
U. S. Department of Agriculture, Washington, D. C., and

H. A. WHITTAKER,
State Board of Health, Minneapolis, Minn.

The material for this paper is based upon the data secured in the recent investigation of farm water supplies by the Bureau of Plant Industry, United States Department of Agriculture, in co-operation with the Minnesota State Board of Health. The original data appears in detail in a bulletin entitled "Farm water Supplies of Minnesota," issued as Bureau of Plant Industry Bulletin No. 154.

In this country the question of the rural water supply is one that has received but little direct attention, yet sufficient epidemiological work has been recorded to indicate that rural sanitation is of vital importance to cities and may extend far beyond the individual farms exhibiting disregard for the laws of modern sanitation. The need of sanitary care and protection of the farm water supply is more necessary as the sparsely populated areas become more congested from year to year by the influx of settlers into these districts, and it is obvious that a study of the sanitary condition of the farm water supply in connection with the epidemiology of rural typhoid should throw some light upon the relation of the water supply to the prevalence of this disease.

In considering the results of this investigation it must be kept in mind that the data presented have been collected within the boundaries of one state, Minnesota. This state, however, exhibits a wide range in rural conditions so that certain conclusions must be of general application. In planning this investigation regions showing various types of water supplies

* Read before the Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

common to rural districts were selected for exhaustive study. These supplies can be conveniently divided into two classes: Underground supplies, consisting of dug wells, bored wells, drilled wells, driven wells, and springs; and surface suplies, consisting of rivers, lakes, surface reservoirs, and cisterns.

The plan of collecting data is briefly as follows: A careful sanitary inspection was made which included a map drawn while at the farm showing the relative positions of the water supply and the various farm buildings and also indicating obvious drainage courses. Chemical and bacteriological samples were collected from each supply and shipped to the laboratories of the Minnesota State Board of Health for examination. The plating of the bacterial samples was done in the field immediately after collection with the aid of a traveling laboratory outfit designed especially for this purpose.

The investigation included a detailed sanitary survey of seventy-four farms, and an examination relative to their purity of seventy-nine water supplies. The types of supplies numbered as follows: Twenty-eight dug wells, six bored wells, thirteen drilled wells, nineteen driven wells, two springs, four rivers, two surface reservoirs, and five cisterns. Of the total number examined twenty were found to be in good sanitary condition and fifty-nine showed strong evidence of pollution. It will be well to state here that the number of polluted supplies shown in this investigation is much larger than would be found if examination had been made of all the rural water supplies in any large area. This is due largely to the fact that frequently bad supplies were deliberately selected in order to further the epidemiological studies, thus making the average condition of the water supplies of the region secondary.

In interpreting the data secured both from the field inspection and the laboratory work the distinction between a good and polluted supply is based upon the sanitary inspection, the bacteriological data, and the chemical data, greatest emphasis being given to the sanitary inspection and least to the chemical data. It is evident that in general, carelessness in regard to protection against surface wash and surface seepage are responsible for the large proportion of contaminations indicated. For

example, of twenty-two polluted dug wells sixteen were badly located and seventeen showed evidence of lack of protection from surface pollution. In the order of their susceptibility to pollution the wells arrange themselves in the following order: Dug, bored, drilled and driven. Although the drilled well is usually much deeper than the driven well, a larger percentage was found to be polluted, a fact which evidently is due to the greater care required in guarding against the seepage of surface water down the outside of the casing and into the water-bearing strata in the former. The springs examined were polluted though protection from surface wash would make them safe. The surface supplies, the rivers, surface reservoirs and cisterns, were all polluted, and it is doubtful if satisfactory supplies for farm use can be secured from such sources.

In this investigation twenty-three farms were located which gave a record of typhoid. On eleven of these farms it was impossible to locate the source of infection, usually because the cases were old and little authentic data could be secured. On two of the farms possible sources were determined and on ten the data seemed to locate definitely the source of infection. Of the ten farms last mentioned five gave evidence of direct infection from water, four from river supplies, and one from a city supply of artesian well water. In the case of two other farms the wells appeared to be factors in the spread of the disease. Typhoid upon the remaining three farms was evidently due to outside infection. The water supplies of all except the last-mentioned three farms were polluted, yet in only two cases did the farm well seem an important factor in the transmission of typhoid. It is not intended to clear the farm well of being a source of typhoid infection, yet it would be well to change somewhat the conception too frequently entertained that the farm well is mainly responsible for typhoid, and to include in epidemiological records other possible sources of infection and transmission.

Attention should be called to the fact that of the 54 farms with polluted supplies 18 showed a present or past typhoid record, or one farm in every three, and a total of 38 cases, or 2.11 cases for each outbreak, while 5 of the 20 farms having good supplies showed typhoid, or one farm in every four, and a total

of 8 cases, or 1.6 cases for each outbreak. Admitting that our data is insufficient, we draw the following provisional conclusions:

1. The water supply usually is not the source of typhoid upon the farm.

2. The more extensive outbreaks of typhoid upon farms are associated with polluted water supplies.

3. The condition of the water supply usually represents the sanitary condition of the farm, and therefore indicates the potentiality of a typhoid outbreak.

THE CONTROL OF ALGAL POLLUTION IN THE RESERVOIRS OF THE CANAL ZONE.

By KARL F. KELLERMAN,
Washington, D. C., and
JAMES O. MEADOWS,
Oconomowoc, Wis.

The water supply of the Canal Zone of the Isthmus of Panama consists essentially of four artificial reservoirs; the Rio Grande, located near Culebra, with a capacity of 496,670,000 gallons; the Comacho, located near Empire, with a capacity of 296,000,000 gallons; the Carabali, located near Gorgona, with a capacity of 80,000,000 gallons; and the Brazos Brook, located near Mt. Hope, with a capacity of 641,000,000 gallons.

It is evident that the conditions obtaining upon the Canal Zone are very favorable to the growth of the algae causing odors and tastes in water, and as early as January, 1907, such pollution was seriously menacing the potability of the supply. During 1906 perceptible odors and tastes developed in the Rio Grande reservoir, which supplies the city of Panama of the Republic of Panama, and in the Brazos Brook reservoir, which supplies the city of Colon of the Republic of Panama, as well as a portion of the Canal Zone. On February 12, 1907, systematic microscopic examinations of these supplies were begun. At this time diatoms were so numerous as to give the water in the Rio Grande reservoir a brownish color, and Chara fragilis was rapidly extending throughout the shallows; Gleotrichia natans, Anabaena flos-aquae and Oscillatoria tenuis were also present in sufficient quantity to be objectionable. In the Brazos Brook reservoir Anabaena flos-aquae and Oscillatoria tenuis were the only objectionable organisms prevalent. The former reservoir was treated on February 14, 1907, with 735 pounds of copper sulphate. This date would have been most suitable for treating the Brazos Brook reservoir also, but owing to a temporary scarcity of copper sulphate, it was necessary to delay this treatment until

* Read before the Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

February 28, when 800 pounds of copper sulphate were placed in the reservoir. The following tables† show the results of these applications:

TABLE SHOWING EFFECT OF COPPER TREATMENT UPON ALGAE IN THE RIO GRANDE RESERVOIR.

735 Pounds of Copper Applied February 14, 1907.

	Feb. 12	Feb. 14	Feb. 19	Feb. 22	March 1
Gleotrichia	50	55	5	1	0
Anabaena	30	30	1	0	0
Oscillatoria	25	30	1	2	0
Eudorina	30	30	75	30	7
Diatoms (Chiefly Navicula)	1000	1200	400	200	25
Trachelomonas	17	15	17	3	0
Chara	*	*	*	*	*

* On Feb. 12 and 14 Chara abundant in shallows, green and vigorous; on Feb. 19, white and flaccid; on Feb. 22, decaying· on March 1, only a few fragments visible.

TABLE SHOWING EFFECT OF COPPER TREATMENT UPON ALGAE IN THE BRAZOS BROOK RESERVOIR.

800 Pounds of Copper Applied February 28, 1907.

	Feb. 12	Feb. 15	Feb. 27	March 2	March 4
Anabaena	150	150	250	7	0
Oscillatoria	150	250	450	12	0
Diatoms (Chiefly Navicula)	75	30	75	30	5
Trachelomonas	5	3	5	5	0
Chara	Small quantity.			0	0

Evidently by March 4, 1907, the supplies were biologically in a satisfactory condition. These two reservoirs have since required very little copper to keep the algae in subjection; even the Chara in the shallows of the Rio Grande reservoir has not appeared again. Practically similar histories describe the algal conditions obtaining in the Comacho and Carabali reservoirs, Anabaena being the most troublesome organism in Carabali and Gleotrichia the most troublesome in Comacho.

† Karl F. Kellerman. Second Report to the Chief Engineer of the Isthmian Canal Commission, March 11, 1907.

A less distinct odor than that due to algal pollution gave some trouble in the water supplies of the Canal Zone during the years 1907 and 1908.‡ This was due to the stratification and stagnation of the lower layers of the reservoirs, which with the rather high organic content and the uniform high temperature of the water furnish suitable conditions for a slow putrefaction. These odors have been removed by the simple device of installing an air-compressor and blowing air through a perforated pipe into the bottom of the gate-house at the Rio Grande reservoir and introducing air into the pump suction at the Brazos Brook reservoir, thus agitating and aerating the water before it enters the mains.

‡ James O. Meadows. Chemical and Bacteriological Report on Water Supplies of the Canal Zone. Report of the Isthmian Canal Commission, Appendix C. pp. 111–119. 1908.

A COMPARATIVE STUDY OF FECAL STREPTOCOCCI FROM THE HORSE, THE COW AND MAN. *

C.-E. A. WINSLOW and G. T. PALMER,
Boston, Mass.

(ABSTRACT).

The work of the bacteriologists of the English Local Government Board, which has thrown so much light on the systematic relationships of the streptococci, indicates that these organisms may prove of special value in water analysis as criteria for differentiating fecal pollution from different animals. Gordon and Andrewes and Horder maintained that the streptococcus of the horse can be distinguished from those of human origin by its failure to acidify lactose media; on the other hand Houston found that streptococci from the cow produced acid from lactose in a large majority of cases. In the present investigation we have tested this point by isolating one hundred strains of streptococci from the feces of each of three animals (the horse, the cow and man); we have cultivated them in broth containing four different fermentable media (dextrose, lactose, raffinose and mannite), and determined by titration the amount of acidity produced by each strain in each medium. An examination of the results obtained confirms and harmonizes the work of the English observers in all particulars. The commonest streptococci in human feces are *Str. mitis* (acidifying dextrose and lactose), and *Str. fecalis* (dextrose, lactose and mannite). In the cow *Str. fecalis* is rarer; but its place is taken by *Str. salivarius* (dextrose, lactose and raffinose), and *Str. equinus* (dextrose alone). *Str. fecalis* is not very abundant even in human feces, however, nor is *Str. salivarius* in bovine feces. In general, the human and bovine types are similar. In the feces of the horse on the other hand practically all the streptococci present are of *Str. equinus* type. Only 4 out of 100 strains produced an appreciable acidity in any other medium than dextrose broth.

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

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This is a practical point of considerable importance, which ought to make it possible to distinguish road washings, mainly polluted with horse droppings, from sewage pollution of other sorts. A test for lactose-fermenting streptococci, which could easily be made by inoculating lactose broth, incubating for several days and then plating on lactose agar, should if positive show human or bovine rather than equine pollution.

THE DETERMINATION OF THE NUMBER OF BODY CELLS IN MILK BY A DIRECT METHOD.

By S. C. PRESCOTT and R. S. BREED
Boston, Mass.

(ABSTRACT.)

The methods in general use for determining the number of cells present in milk are all based on the use of the centrifuge. The assumption is that all but a small fraction of the cells are precipitated and also that this fraction is a fairly constant proportion of the whole and can safely be neglected. An investigation carried on in the Boston Biochemical Laboratory during the past summer has shown both of these assumptions to be incorrect. By the use of a new method, it has been found that the distribution of the cells in a given sample of milk after centrifuging varies greatly in different samples of milk, although their distribution is approximately the same in different samples of the same milk. Usually more than half are present in the cream, one-fourth or less in the precipitated slime, and the remainder in the skim milk.

The variation in position of cells in different samples is apparently due to the variable percentages of cream present. The distribution of the cells in a centrifuged sample corresponds closely to the previously known distribution of bacteria in similar samples.

The new method by which these facts have been ascertained is as follows: a measured drop (.01 c. c.) of milk to be examined is spread evenly over a measured area (1 sq. cm.) on a glass slide, dried with gentle heat, the fat dissolved out with xylol, fixed with alcohol for a few minutes, the slide again dried and over stained with methylene blue and partially decolorized with alcohol. The number of cells present is then determined by examination with the microscope. Results done in duplicate

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October. 1909.

show a small percentage variation proving that the practical error is not a large one.

A series of tests of milk show that much larger numbers of cells are normally present in milk than has been supposed. The average number of cells present in the samples examined is approximately 1,500,000 per cubic centimeter, while numbers less than 100,000 per c. c. are uncommon.

ARTIFICIAL MILK: A SUBSTITUTE FOR ORDINARY MILK AS A LABORATORY MEDIUM.*

By H. W. HILL, M. D.,
Epidemiologist, Minnesota State Board of Health.

The following formula for the making of artificial milk has been found to obviate many of the difficulties, annoyance, and delay encountered in securing good milk of a uniform composition for the making of milk media in the laboratory:

† Nutrose, 2.4 grams.
Lactose, 1.0 grams.
Water, Dist., 100 c. c.
Dissolve cold—for 12 hours. Shake thoroughly and filter through cotton. Tube and sterilize at 110° centigrade for 20 minutes.

In order to distribute credit for this material properly it is only fair to say that the first work done upon it, so far as I know, was done in the laboratories of the Boston Board of Health in 1899, then under my direction. The matter lost interest at the time and lay fallow until difficulty in the laboratories of the Minnesota State Board of Health recalled it to my mind. Mr. J. C. Clarke, an assistant in the laboratories, was furnished with available data and was asked to work out a formula by the method of "trial and error." When he succeeded in getting a medium which would "stand up" Dr. A. J. Chesley, of the same laboratories, compared the results from the artificial milk with those of ordinary milk in a long series of bacterial tests, greatly to the advantage of the former, particularly in the uniformity of result. Briefly, the advantages are that the materials may be always at hand, the method of making up is simple and rapid, no difficulty is encountered from the presence of fat; bacterial changes in the raw material do not have to be taken into account, the proper reaction is obtained without adjustment, a uniform product is secured and since the composition is accurately known, the effects produced by the bacteria upon the media can be interpreted with a fair degree of reasonable accuracy.

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

† Nutrose is supposed to be sodium-phosphate-casein and can be obtained from Victor Koechl & Co., 122 Hudson St., New York.

THE BACTERIAL FLORA OF MILK HELD AT LOW TEMPERATURES.*

By Dr. M. P. RAVENEL, Prof. E. G. HASTINGS, and B. W. HAMMER,
University of Wisconsin, Madison, Wis.

(ABSTRACT.)†

CONCLUSIONS.

In milk held at —9° C. there is a clumping of the casein and fat, no increase in bacteria developing on agar and gelatine, and an increase in the amount of soluble nitrogen and a decrease in the acidity.

In milk held at 0° C. there is a marked increase in the bacterial content resulting in an increase in acidity, an increase in the percentage of soluble nitrogen so that it eventually amounted to over 70 per cent. of the total nitrogen, and a decrease in the total nitrogen content probably due to a liberation of free nitrogen.

This work has especial importance in connection with the handling of one dairy product, viz., cream. The amount of cream received by the city milk dealer does not vary widely from day to day, while the demand for it varies, being influenced by temperature conditions, occurrence of holidays, etc. The storage of cream for considerable periods is therefore practiced. As is shown by the data presented, the temperature of storage, 33° to 40° F., is such as to prevent the growth of the ordinary lactic bacteria, but not the growth of the putrefactive organisms.

The cream may be normal in appearance and taste, yet contain the by-products of the putrefactive bacteria in such amounts as to render it harmful. Poisoning by ice cream is quite frequent, by milk very rare indeed. The question may be raised, could not many of the cases of ice cream poisoning be traced to the use of cream in which, during prolonged storage, toxic products have been formed?

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* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

† Published in full in the Journal of Infectious Diseases, January 15, 1910.VII, 38.

In pasteurized milk the lactic acid bacteria are usually absent, a free field is left for the putrefactive spore-forming bacteria, whose action on the milk may not be apparent to the consumer, and yet the milk may be distinctly harmful.

The practical effects of cold storage are identical with pasteurization in removing from the sphere of action the class of bacteria that prevent the growth of harmful kinds of organisms, while allowing the harmful bacteria to develop.

THE BACTEREMIA THEORY OF TUBERCULOSIS: A REFUTATION.*

JOSEPH McFARLAND, M. D. E. BURVILLE-HOLMES, M. D., E. J. G. BEARDSLEY, M. D., and EUGENE A. CASE, M. D.
Philadelphia.

(ABSTRACT)†

During the past few years Dr. R. C. Rosenberger, of Philadelphia, has made a series of contributions, first with reference to the reliability of the various methods of staining the tubercle bacillus and other acid-proof bacilli, and their resistance to decolorants; second, with reference to the frequency with which tubercle bacilli occur in the feces of tuberculosis patients, and third with reference to the presence of tubercle bacilli in the blood of persons afflicted with tuberculosis. His conclusion was that tuberculosis is primarily a bacteremia which is followed by secondary localization of the organisms and the occurrence of the well-known lesions. This conception was so revolutionary that it could not be accepted without hesitation and without much confirmation. Accordingly, a varied series of experimental investigations was begun, and carried to completion so recently that they have not yet appeared in the Reports of the Henry Phipps Institute. It is because of the unavoidable delay in this publication that this preliminary report is made.

Of the cases at the Phipps Institute, a total of fifty were examined. In the blood of the forty-nine cases known to be tuberculous, not a single tubercle bacillus could be found; in the one almost certainly not tuberculous, acid-fast organisms were found in very small numbers. At the Bryn Mawr Hospital four cases were studied. In all of these four cases, acid-fast bacilli were found in the blood in large numbers. The contradiction was most perplexing.

Just at this appropriate moment Brem published his paper, "Investigation of Blood for Tubercle Bacilli," (Journal of the American Medical Association, Sept. 18, 1909, Vol. LIII, No. 12,

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.
†Published in full in the Journal of the American Medical Association, February 19, 1910; LIV, 593.

p. 909), in which it was declared that the laboratory distilled water when permitted to stand for some time becomes the habitat of an acid-fast bacillus, easily mistaken for the tubercle bacillus, admitted to the specimens of blood during the technical preparation, and leading to erroneous conclusions when the slides are studied. Brem first thought to fix the sediment, collected by centrifugation and evaporation, to the slide with albumen and so caught and retained the organisms, and this plan seeming to be an excellent one, we adopted it and made a study of the laboratory distilled water at the Bryn Mawr Hospital, and at the Phipps Institute. The results were of surpassing interest, for the water from the former institution was found to contain great numbers of acid-fast bacilli, not unlike tubercle bacilli, and resisting the decolorant effect of Papperheims solution, while the water of the latter institution none were found. The whole matter immediately became clear, and our paradox explained. At Bryn Mawr where the distilled water was full of the acid-fast organisms, they entered the blood during the sedimentation following the addition of the citrate solution, or, in the later suggested technic, during the laking of the blood, being caught in the soft film of adhesive material and fixed with it, and so were present in all the specimens of blood derived from tuberculous or non-tuberculous cases. At the Phipps Institute where the water must have contained exceedingly few of the organisms, they contaminated only one of the many preparations made.

From these experiments and experiences we feel constrained to believe that Rosenberger has been the unfortunate victim of a mistake, the peculiar character of which it was exceedingly difficult to discover. We believe that the presence of these "water bacilli" in the preparation explain most of the cases in which what were supposed to be tubercle bacilli were found in the blood or feces, and that the use of the Pappenheim reagent explain the remainder. That in consequence there is every reason to believe that tubercle bacilli do not often circulate in the blood in quantities capable of ocular demonstration and that the deductions made by Rosenberger, that tuberculosis is primarily a bacteremia, and that the easiest and earliest means of arriving at a diagnosis is by an examination of the blood, are unsupported by reliable evidence.

NOTE ON AN ORGANISM ISOLATED FROM WASHINGTON TAP WATER, AGGLUTINATED READILY BY THE SERUM OF TYPHOID FEVER PATIENTS.*

By W. H. FROST,
Passed Assistant Surgeon, U. S. Public Health and Marine-Hospital Service, Washington, D. C.
(From the Hygienic Laboratory).

(ABSTRACT.†)

An organism isolated from the filtered Potomac River water of Washington, D. C., was found to be agglutinated strikingly by specific antityphoid serum.

The organism culturally resembles the proteus group of bacilli.‡ It was found to be quite common in the filtered Potomac River water during August, 1909; less so during September and October. Several strains, isolated at various times, proved identical.

For isolation of this organism, lactose bile or lactose bouillon fermentation-tubes were plated out on Endo's medium; clear colonies transferred to bouillon, and tested after twenty-four hours with antityphoid serum. The organism has never been isolated from fermentation-tubes in which *B. coli* could be demonstrated. It has been found only in the filtered water, never in the raw Potomac River water.

This organism was agglutinated by antityphoid horse serum, of titer 1-50,000 in dilution of 1-2000; by another specific antityphoid horse serum of titer 1-5000 in dilution of 1-200.

It was not agglutinated by normal rabbit serum (1-20) nor by rabbit serum specific for para-typhoid B.

Normal human serum (10 specimens) failed to agglutinate this organism in dilution of 1-20 within one hour. Tests were made with the serum of fifty-one cases of suspected typhoid fever.

* Read before the Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

† This organism is described in detail in Bulletin 66 of the Hygienic Laboratory, U. S. Public Health and Marine-Hospital Service, Washington, D. C., 1910.

‡ Later studies of the flagella have shown that this organism is a pseudomonas, and cannot, therefore, be properly classed as belonging to the proteus group of bacilli.—W. H. F.

The cases which proved to be typhoid fever, grouped according to stage of disease at which serum was tested, gave the following reactions with *B. typhosus* and the water-organism, respectively:

		Agglutinated *B. Typhosus*	Agglutinated water-organism
Cases in 1st week,	8	3	5
Cases in 2nd week,	11	6	9
Cases in 3d and 4th week,	13	9	11
Total,	32	18	25

Agglutination was considered positive only when taking place in dilution of 1-40 or higher within one hour.

Four cases of para-typhoid fever (A and B) gave positive agglutination reactions with the water organism and with the corresponding para-typhoid organisms. The cases of diseases definitely diagnosed as not typhoid fever all gave negative reactions with this organism.

Saturation of the serum of typhoid fever patients (2) with typhoid bacilli removed the agglutinins for both *B. typhosus* and the water organism.

Saturation of the serum (1 case) with the water organism removed the agglutinins for this organism, but not the agglutinins for *B. typhosus*.

The serum of rabbits immunized against this organism agglutinated this organism, but not *B. typhosus*.

The agglutination of this organism by the serum of persons and animals infected with typhoid bacilli is regarded as a group agglutination due to the specific typhoid agglutinin.

PANCREATIN-BILE SALT MEDIUM FOR THE DETECTION OF B. COLI IN WATER.*

By LUTHER R. SAWIN,
Mt. Kisco, New York.

In the routine analysis of potable waters in a laboratory, the desideratum of the bacteriologist is to obtain a medium, which by its selective action, shall inhibit the growth of all but sewage bacteria. As the colon bacillus is the normal inhabitant of the intestine of man and many of the lower animals, it is considered a typical fecal organism and its presence in water is regarded as an index of contamination. Hence the problem confronting the water-analyst resolves itself into the device of a method which shall be accurate for the detection of *B. coli.* But where a considerable number of waters are regularly examined, the procedure should be not only reliable, but reasonably rapid. The old standard method of planting a portion of the sample either directly or after rejuvenation on lactose-litmus agar, fishing the red colonies, and putting them through the various bacteriological or bio-chemical tests is slow, tedious and to be avoided if possible.

Fortunately for the analyst, the colon bacillus is one of those bacteria which readily indicates its presence by its power to ferment sugar with the formation of organic acids and the evolution of hydrogen and carbonic acid gas in definite proportions. This characteristic is the factor on which all or nearly all the presumptive tests are based.

Different investigators have from time to time called attention to various fermentable media, all of which, with the exception of dextrose-broth,[1] contains some reagent which retards or is supposed to retard the growth of all but the colon bacillus. Phenol broth has been used to some extent; Parietti solution has been recommended by some bacteriologists; Neutral Red has also been employed, but any advantage to be gained from its use is to be questioned; McConkey[2] introduced the use of bile

* Read before the Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

salts. All of the above methods have been employed experimentally to a greater or less extent by different investigators, and while there is some disagreement as to the merits or demerits of these media, there seems to be a consensus of opinion that dextrose broth, when inoculated with a polluted water is unreliable, since it permits the growth of streptococci, which may prevent the development of *B. coli* and the subsequent formation of gas, which is indicative of its presence. On the other hand, the employment of phenol Parietti solution, and Neutral Red reverses the difficulty, for these reagents not only inhibit the growth of water bacteria, but also that of *B. coli* especially if few in number or at all attenuated.

In 1906, Jackson[3] introduced lactose-bile as a medium for the detection of *B. coli* in water. As to its merits, there has been considerable discussion among bacteriologists. Longley[4] states that in waters of considerable pollution, there is an advantage in its use but in dealing with waters that are unpolluted or only slightly polluted, the bile inhibits the growth of *B. coli.* Prescott and Winslow [5] state that in waters not heavily polluted, bile on the whole is inferior to dextrose broth, yet in conclusion, they say that its use yields results that seem to approximate the actual extent of pollution. In connection with these criticisms and the conflicting opinions regarding the various media, it may be that there is a tendency to lay too much stress on the detection of *B. coli* when attenuated; for this bacillus by changed environment may have evolved into a distinct strain, with certain colon characteristics (gas production being one) and yet not be indicative or recent or dangerous contamination. For after all, the real object of the examination is not so much the detection of the colon bacillus as the judgment of the sanitary quality of the water. It is certain that waters that cannot possibly be contaminated give occasionally the presumptive test for *B. coli* in dextrose broth.

The use of lactose-bile and the difficulty of obtaining it fresh (for it must be obtained fresh or decomposition sets in and it is rendered valueless for coli work) has suggested that an artificial bile medium might be compounded. The one devised and which has given very satisfactory results so far, is made up as follows:

Water	1000 cc.
Peptone	10 g.
Lactose	10 g.
Beef Extract	7.5 g.
Gelatine	5 g.
Sodium Glycocholate	2 g.
Pancreatin	1 g.

Heat the first five ingredients over boiling water or steam for thirty minutes and neutralize in the usual way. Then add 2 grams of sodium glycocholate dissolved in as little hot water as possible and add 1 gram of pancreatin.

In the work with this medium, it has been made up with and without both the pancreatin and the gelatine. The addition of the gelatine in the work on sewages gave a slightly larger percentage of gas; that of pancreatin, however, yielded a decidedly higher percentage of gas. To show the effect of this ferment, a series of Smith tubes were filled with the medium made up according to the above formula; and another set with the medium without the pancreatin. A rejuvenated culture of *B. coli* was added to a flask containing sterilized water, and equal amounts of this were introduced into these tubes as well as into a series of Smith tubes containing both dextrose broth and lactose-bile. The following tables shows the amounts of gas evolved at 37° C. with the use of the different media.

TABLE I.

AMOUNTS OF GAS EVOLVED BY B. COLI IN THE DIFFERENT MEDIA.

Media Used	Readings Taken After				
	24	48	72	96 hours	
Dextrose Broth	27	34	37	..	(1)
Lactose-Bile	11	48	53	54	(2)
Medium without Pancreatin	23	32	39	38	(3)
Medium with Pancreatin	32	44	55	56	(4)

Averages of (1) 12; (2 and 3) 24; and (4) 36 tests.

With this medium the average percentage of carbonic acid gas was 33 per cent. of the total gas production or the amount,

which according to Whipple, Irons and other authorities the colon bacillus is credited with producing in a fermentable sugar solution, although in some later work it was found that pure cultures of *B. coli* gave 30% of carbonic acid gas in dextrose broth and 37% in lactose-bile.

Comparative tests were made with *B. coli* to ascertain the relative sensitiveness of lactose-bile, dextrose broth and this medium both with and without the pancreatin. For this purpose, the first of a series of dilution tubes, containing 9 c. c. of sterilized water, was inoculated with revivified cultures of the colon bacillus. From this tube 1 c. c. was added to the next tube and so on down the series, successive dilutions were made. From each dilution tube 1 c. c. quantities were both plated on gelatine and introduced into Smith tubes of the different media to be compared. The percentages of gas evolved in the tubes were read after 96 hours incubation at 37° Cent. and counts made on the plates after 72 hours at 20° Cent. As a result, it was found that in three out of four cases one medium was as sensitive as another. The average number of bacteria on the plate corresponding to the highest dilution which produced gas was 1.6 per c. c. in the fourth case, however, gas was produced in dextrose broth in the ninth dilution while with the other media, there was no gas production beyond the eighth.

The above media were tested with *B. cloacae*, *B. enteritidis* and *B. lactis aerogenes* as well as with *B. coli* to show the relative gas producing power of these organisms. Smith tubes with the different media under consideration were inoculated with rejuvenated cultures of these organisms and the gas yield after 24, 48, 72 and 96 hours noted. The following table gives the amounts of gas produced and the percentages of carbonic acid gas when the total amounts of gas were sufficient to warrant making absorptions.

TABLE II.

PERCENTAGES OF GAS EVOLVED BY DIFFERENT ORGANISMS IN DIFFERENT MEDIA.

ORGANISMS	MEDIA																			
	Detrose Broth					Lactose-Bile					Pan.-Bile Salt					Medium Without Pancreatin				
	Percentage of Gas After				% CO_2	Percentage of Gas After				% CO_2	Percentage of Gas After				% CO_2	Percentage of Gas After				% CO_2
	24	48	72	96 hr.		24	48	72	96 hr.		24	48	72	96 hr.		24	48	72	96 hr.	
B. coli..........	27	34	36	(1) ..	27	17	48	53	(1) 54	36	33	44	49	(3) 49	33	17	33	39	(2) 38	25
B. cloacae........	28	51	60	(2) 63	58	0	1	4	(1) 14	..	0	3	8	(2) 13	..	0	3	9	(1) 12	..
B. enteritidis.....	31	33	31	(1) 30	..	0	0	0	(1) 0	..	0	0	0	(1) 0	..	0	0	0	(1) 0	..
B. lactis aerogenes	13	18	22	(2) 24	23	0	36	56	(1) 60	37	0	15	28	(1) 33	21	0	18	34	(1) 39	23

Averages of (1) 12; (2) 24; and (3) 36 tests.

With the pancreatin-bile salt medium the amount of gas production with the four different organisms was about the same as that with lactose-bile except in the case of *B. lactis aerogenes*. This species gave about the same gas production as *B. coli* in the lactose bile but considerably less gas was evolved when inoculated in pancreatin-bile medium.

It is well known that with sewages or badly polluted waters, dextrose broth in the presumptive test, frequently gives negative or atypical results. This erratic behavior is generally attributed to an overgrowth by streptococci. The antagonistic effect of this organism on the growth and development of *B. coli* and the subsequent gas production in different media, is shown in the following experiment.

A flask of sterilized water was inoculated with a revivified culture of streptococci. This, by a count made on lactose agar after seventy-two hours' incubation at 37° Cent., was found to contain 33,000,000 streptococci per c. c. One c. c. quantities of this were introduced into 12 fermentation tubes, each of dextrose broth, lactose-bile and this medium. One c. c. of a revivified culture of *B. coli*, which by counts made on agar after 72 hours, was found to contain 230,000,000 *B. coli* per c. c., were added to the first of a series of eleven dilution tubes, containing 9 c. c. of sterilized water. From this 1 c. c. was added to the next tube, and so on down the series, successive dilutions were made. One c. c. quantities of this culture were also added to the first fermentation tubes of the dextrose broth, lactose-bile and the pancreatin-bile salt medium previously inoculated with the streptococci. From the first dilution tube, containing 23,000,000 *B. coli* per c. c., 1 c. c. portions were added to the second fermentation tubes of the different media; and so on down the series, 1 c. c. quantities from the other dilution tubes were added to the corresponding fermentation tubes of the different media. Twelve Smith tubes of dextrose broth to be used as a control were also inoculated with 1. c. c. quantities from the different dilution tubes of *B. coli*.

The following table shows the number of streptococci and *B. coli* added to each tube and the percentages of gas evolved after 72 hours' incubation at 37° Cent.

TABLE III.

SHOWING PERCENTAGES OF GAS PRODUCED WHEN STREPTOCOCCI AND *B. coli* WERE GROWN TOGETHER IN DIFFERENT MEDIA.

TUBE NO.	1	2	3	3	5	6	7	8	9	10	11	12
No. *B. coli* added	230,000,000	23,000,000	2,300,000	230,000	23,000	2,300	230	23	2.3	.....	.....	.....
No. Streptococci	33,000,000,	33,000,000,	33,000,000	33,000,000	33,000,000	33,000,000	33,000,000	33,000,000	33,000,000	33,000,000	33,000,000	33,000,000
Percentages of Gas Evolved in												
Dextrose Broth	14	10	3	0	0	0	0	0	0	0	0	0
Lactose-Bile	46	40	30	28	14	18	8	10	25	0	0	0
Pancreatin--Bile Salt	40	50	44	54	30	20	26	20	25	0	0	0
Control, (no Streptococci)	44	30	40	50	54	42	32	35	25	42	0	0

The work has been repeated several times with reasonably concordant results. With lactose-bile and pancreatin-bile salt medium, the highest dilutions showing positive tests were generally the same. The control always gave a positive test in one or two dilutions higher than the lactose-bile or pancreatin medium. The fermentation tubes of dextrose broth often failed to give any positive result whatever and never beyond the second dilution. The relative gas production in the various tubes depends to a certain extent on the condition of the cultures used in the work. A fresh culture of *B. coli* when grown with an old one of streptococci will give a larger number of positive tests in all the media than when the streptococci is vigorous and the *B. coli* old or attenuated. From the foregoing work, it is evident that in dextrose broth, streptococci almost entirely inhibit the growth of *B. coli* even when the latter are present in large numbers; that when these organisms are sown together in lactose-bile or in pancreatin-bile salt medium, a slightly inhibitive action on the growth of *B. coli* is effected, since the fermentation tubes inoculated with few *B. coli* gave negative results while the corresponding tubes in the control yielded positive tests.

To ascertain the practical efficiency of this medium, it has been used as a test for waters of known sanitary quality; for those

containing from a few to several million bacteria per c. c. With this work, dextrose broth or lactose-bile or both have been used as controls, and in some cases *B. coli* detected by planting on Wurtz agar, fishing and putting through the regular tests. For convenience the waters have been divided into three classes: viz., grossly polluted (sewages), polluted streams receiving barn-yard drainage and street wash, and ponds situated in sparsely inhabited districts where there is little danger of contamination.

Of the first class, forty sewages, containing from 65,000 to 2,000,000 bacteria per c. c. with an average of 650,000 bacteria per c. c. were used. Inoculations were made into Smith tubes of this medium in dilutions of from 1-10,000 to 10 c. c. and readings taken at twenty-four hour intervals after incubation at 37° Cent. Like quantities were inoculated into lactose-bile for a control. Except in the 1-10,000 and 1-1,000 dilutions, the lactose-bile results checked those obtained by the use of this medium. The following table shows the average percentages of gas produced with the use of this medium when inoculated with sewages.

TABLE IV.

PERCENTAGES OF GAS PRODUCED IN PANCREATIN-BILE SALT MEDIUM WHEN INOCULATED WITH SEWAGES.

Dilution	Percentage of Gas After			
	24	48	72	96 hours
1-10,000	13	31	35	35
1-1000	15	38	46	46
1-100	17	38	45	45
1-10	18	36	43	48
1	27	46	52	52
10	40	44	52	58

In this work there were no anomalies, i. e., there were no tubes showing less than 25% of gas where the next higher dilution gave gas production of over 25%. In the control work with

lactose-bile, the percentages of gas evolved were slightly higher.

Of 23 waters from polluted streams examined for *B. coli*, 70% in 0.1 c. c., 83% in 1 c. c., and 95% in 10 c. c. portions gave positive tests with this medium. Like dilutions with lactose-bile gave 61, 74 and 87% positive tests. The average percentages of gas, where positive tests were obtained, were 44, 53 and 54 in 0.1, 1, and 10 c. c., portions against 60, 70 and 68 per cents with like quantities in lactose-bile. Two anomalies were obtained by both methods of analyses.

Of the third class of waters or those whose purity is known to be reasonably good, fifty-six samples were tested with the three media. The number of positive tests after seventy-two hours' incubation and the anomalies are recorded below.

TABLE V.

Number of Positive Tests and Anomalies Obtained by Use of Different Media.

Medium	Positive Tests in			Anomalies
	0.1	1.	10. cc.	
Dextrose Broth..............	16	37	43	9
Lactose-Bile................	6	6	19	8
Pancreatin-Bile salt.........	2	17	30	3

In the 0.1 c. c. portions, none of the positive tests of the pancreatin-bile salt medium and only one of the lactose-bile; and with the 1. c. c. portions, 11 positive tests of the pancreatin-bile salt medium and 4 of the lactose-bile checked those of the dextrose broth. With the 10 c. c. portions, 18 and 11 of the results obtained by the use of these respective media, checked those of dextrose broth. A comparison of the figures derived from the work with the pancreatin-bile salt and lactose-bile showed no closer agreement of results. Moreover, in the 10 c. c. portions of lactose-bile 3 gave positive tests where the dextrose broth gave negative results. With such discordant data as this, how is the water-analyst to form judgment of the sanitary quality of the water? It is highly improbable that the dextrose broth

figures are a correct criterion of waters from uncontaminated sources like these. The lactose-bile and the pancreatin-bile salt seem to yield results nearer the truth; but even here, it is doubtful if the waters are as poor in quality as these figures indicate. The argument may be raised that the large number of affirmative tests for *B. coli* is due to contamination by animals; but granting this, how are the discrepancies in the results obtained by the use of the different media to be accounted for?

Referring to the data obtained with sewages and polluted streams, the lactose-bile and pancreatin-bile salt media results checked in nearly every case (and the exceptions were mostly in the higher dilutions). With waters of this character, the high percentage of positive tests verify the contaminated conditions of the streams; but from previous work,[6] it is certain that dextrose broth gives very unsatisfactory results when used in the presumptive test for contaminated waters.

In the foregoing paper, it has been the aim to show the efficiency of pancreatin-bile salt medium for making the presumptive test. With sewages or polluted waters, the results obtained with this medium seemed to conform with the known contaminated conditions, and checked closely the work with lactose-bile. But with waters of good quality, the pancreatin-bile salt test, yielded results, which often disagreed, gave frequent anomalies, and seemed from a knowledge of the conditions to be questionable. If the presumptive test is to be used as a criterion for potable waters, in routine analysis, it may be necessary to modify the various media to suit different characteristics and conditions.

(1) Whipple. Technology Quarterly, Vol. XVI, No. 1, March, 1903.

(2) The Thompson Yates Laboratory Reports, Pt. 1, p. 41.

(3) Jackson. Biological Studies of the Pupils of William T. Sedgwick.

(4) Longley and Baton. Journal of Infectious Diseases Vol. IV, No. 3, pp. 397–416.

(5) Prescott and Winslow. Public Health Association Papers. Vol. XXXIII, pp. 128–136.

(6) Sawin. Journal of Infectious Diseases. Sup. No. 3, pp. 33–38.

A BIOCHEMICAL REACTION FOR DETECTING POLLUTION IN WATER SUPPLIES.*

By ANDREW WATSON SELLARDS and EDWARD BARTOW.

(ABSTRACT.)†

The central problem in sanitary water analysis, at present, is the recognition in the presence of other groups of the colon group of bacteria, by methods which must be fairly rapid and which also give some approximation of the numbers of colon bacilli present. The chemical and bacteriological analyses represent the two types of laboratory methods for the detection of pollution in water supplies. The results of these two methods may frequently bear but little relation to each other. In a previous communication‡ it was noted that this lack of correlation could be partly obviated by modifications of the current methods of analysis. When water samples are inoculated into nutrient broth, the changes which take place in the media—such as ammonia formation—depend upon the bacterial condition and are practically independent of the ammonia content of the original sample. Hence while there may be no relation between the ammonia content and the bacteriological condition of a water sample, yet the ammonia formed in artificial culture was at least approximately proportional to the bacterial condition of the water in question.

This paper will consider the practical application of this principle in its bearing on the interpretation of results and in the development of a method of analysis which may be very broadly regarded as a presumptive reaction for intestinal bacteria. The action of bacteria upon sodium nitrite forms the basis of the presumptive test described in this paper.

One of the disadvantages in the direct sanitary chemical analysis of a water is the difficulty, or the impossibility of differentiating between the products of sewage pollution and normal constituents of the soil. Thus it is not only impossible to

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† This paper is abstracted from an article in University of Illinois bulletin, State Water Survey series No. 7, p. 40.

‡ J. Infect. Dis., Chicago, 1907. Supple. III, 41.

employ universal standards for limits of impurities but even in the case of local standards, the normal quantity may be so high, and so variable that the slight increase which might be caused by pollution would not be greater than the limits of error in analysis or the range of normal variation.

It might be supposed, therefore, that the method which would distinguish between normal constituents of the soil and the same substances arising from bacterial pollution would offer some assistance in the interpretation of analytical data. Since the final decomposition products are the same chemical substances as may occur naturally in the soil, any laboratory method of differentiation must rest upon a bacteriological basis. The following method has been developed with especial reference to free ammonia and nitrites. If a water contains high free ammonia which is being produced by bacterial action, one should be able to continue this production by supplying the suitable food material. On the other hand one may have a water high in ammonia content but almost free from bacteria which produce ammonia; hence there is no agent to cause the further production of ammonia even in the presence of suitable food material. This principle was tested first with two samples of water, one of unquestionable purity from a deep well, and the other from a polluted stream. The pure water, which had a high ammonia content formed only a very small amount of ammonia from the culture media. The polluted water, although relatively low in ammonia, produced ammonia abundantly.

This procedure not only gives a method for distinguishing the source of the ammonia in the two water samples, but it furnishes a definite method for studying the significance of the free ammonia determinations. The next step of importance is the determination of classes of bacteria which are active in producing free ammonia, with special reference to the comparison of the intestinal bacteria and ordinary saphrophytes. Several pure cultures were inoculated into a broth medium. Incubations were carried on for three days at 37° C. Analyses were made by nesslerization after distillation with sodium carbonate from 500 C. C. volumes of a 1-500 dilution.

The results indicate that the colon group is not especially active, giving even much lower results than ordinary saphro-

phytes such as *B. megatherium* and *B. mycoides*. This finding is of significance in its relation to the interpretation of analytical data. High free-ammonia determinations do not therefore in any way indicate the presence of intestinal bacteria, but are merely an indirect qualitative test for the presence of bacteria without giving any definite idea concerning the numbers of species present.

Free ammonia determinations are practically without value for the deep driven wells of Illinois. These wells are in excellent bacteriological condition. The normal free-ammonia content for this region, however, is so high (sometimes 30 parts per million) and so variable that the slight additional amounts, such as are ordinarily caused by pollution, would be insignificant. The access of badly polluted surface waters, or even of sewages, could readily act as a diluting fluid and diminish the concentration of ammonia. On the other hand there are cases where the free-ammonia determinations afford a very delicate index of pollution, notable in lake waters where samples from the center of the lake furnish an accurate standard and changes near the shore can be readily detected. Aside from bacteriological considerations the presence of free-ammonia may possibly be of value as an indirect evidence of the presence of organic matter.

This same principle of analyzing cultures is also applicable in determining the origin of nitrites in a water. It is not possible from the nitrite determination alone, to say whether a given sample is in a very good or a very bad condition, because the best potable waters sometimes contain nitrites and sewages are frequently nitrite free. Such a condition can be most easily explained by the supposition that the bacteria present in sewage are capable of destroying nitrites. To distinguish such extreme types of water, inoculation tests were applied in a manner somewhat analogous to the ammonia determinations. One of the simplest media for obtaining nitrite production is a nitrate broth solution, but since there are so many species of bacteria which reduce nitrates to nitrites, this test, like the free-ammonia determination, would have comparatively little differential value. The experiment was therefore modified so as to test not for nitrite formation, but to observe the conditions under which nitrites are destroyed. A preliminary test was made upon the same samples

of water used in the free ammonia experiments; namely, a polluted creek and a deep well.

The medium used was an ordinary meat extract broth of double concentration with an acidity of 2% of normal acid, and to this was added 2% of gelatin and 0.05% sodium nitrite. The nitrite determinations were made by the customary napthylamine hydrochloride and sulphanilic acid color method.

Analyses of the polluted creek and the well water showed a removal of the nitrites by the polluted water but no removal by the pure water. A series of tests made upon pure cultures showed that, taken as a class, intestinal bacteria are very active in destroying nitrites, and also, for the species tested, those which were most active in forming ammonia did not destroy nitrites.

The delicacy of the reaction for use in water analysis, was tested by two general methods namely: 1. Determination of (a) The maximum time for which the nitrites can exist in a media inoculated with unpolluted waters, and (b) Determination of the minimum time in which a polluted water can destroy the nitrites present in the media. 2. Comparison of the reaction with other methods in detecting slight traces of artificial pollution.

Experiments by the first method gave well marked differences. In the case of four moderately polluted dug wells, the time required for the complete destruction of the nitrites varied from 18 to 36 hours. Deep driven wells and carefully protected dug wells required a much longer time, ranging from four days to two weeks.

To test the delicacy of the reaction by the second method, sterilized water was polluted artificially with pure cultures of *B. coli* and with sewage.

Two cultures of *B. coli* were used, one of which fermented and one which did not ferment saccharose. Emulsions of the bacterial growth were made in water and successive ten fold dilutions prepared. One c. c. quantities of these various dilutions were then inoculated into fermentation tubes containing glucose broth and into nitrite media. In the case of the broth cultures the highest dilution of the emulsions which gave gas formation was, in every case, also sufficient to completely destroy all the nitrites in the media within at least forty-eight hours. Tests upon diluted sewages gave less definite results.

Altogether four different samples were tested. One c. c. samples gave gas production in glucose broth in dilutions 10 to 100 fold greater than could be recognized by the nitrite tests. In these high dilutions, however, the amount of gas formed was not typical of *B. coli*, being only about 20% of the closed arm of the fermentation tube. Where gas production, typical of *B. coli* was obtained, the same dilution also gave complete destruction of nitrites within the forty-eight hour limit.

No attempt has been made to determine the exact nature of the changes which take place during the destruction of the nitrites. In the presence of *B. coli*, oxidation to nitrates could hardly occur since nitrates are rapidly reduced to nitrites by this organism. The destruction of the nitrites in the medium evidently depends upon the growth of bacteria either primarily or by secondary processes; and not on some substances, such as dissolved oxygen, in the inoculated water. In one series where development was inhibited by chloroform, only a minimal reduction in the nitrite content was obtained. Relatively slight variations from the medium used gave results wholly without value. The optimum acidity in a culture medium depends therefor both upon the amount of acid and the amount of proteid present. One per cent of free acid is a very different factor from one per cent acid albumen.

The estimation of the value of any tests in water analysis frequently presents considerable difficulties. If the test is applied directly in routine work, where a large number of samples are examined, extreme waters give definite results, but variations will occur in the important border line cases. Unless a special study is made of such cases no final conclusions can be drawn. A somewhat detailed examination was made on five shallow dug wells.

For this series, wells were chosen, which, judging from the sanitary survey, might be especially subject to variation. Four of the samples are taken from shallow dug wells lined with stone and the fifth from a cistern.

Analyses on successive days show some striking variations. Some of the colony counts, especially are entirely inconsistent. The glucose broth tests were particularly liable to indefinite results. The nitrite tests gave very definite end reactions and entirely consistent results.

Although incomplete routine tests are not well adapted for comparisons of the finer details of different methods, yet they afford a ready means of forming some approximate idea of the general course of any given procedure. With this object in view the nitrite test has been carried out on the regular routine samples received for examination by the State Water Survey. These samples are shipped by various citizens from all parts of the State. The bacteriological samples are packed in ice and usually reach the laboratory within twenty-four hours after the date of collection.

The tables showing analytical data for this and the succeeding experiment are rather too extensive to be included here but they are published in full in Bulletin No. 7 of the State Water Survey.

The results may be classified as follows:

	Results		Method: Glucose Broth Number	Glucose Broth Percent	$NaNO_2$ media Number	$NaNO_2$ media Percent
I	Positive		60	46	62	47
I	Negative		50	54	69	53
I	Indeterminate		21			
II	Agreements		91			69
II	Disagreements		19			15
II	Indeterminate	Glucose media	21			16
II	Indeterminate	$NaNO_2$ media	0			0
	Total		131			

On account of the rather large indeterminate class, the presumptive coli tests were extended to include lactose bile as well as the glucose broth medium with the expectation of securing more decisive results. The data from the two sets of media were not sufficiently varied to justify separate classification.

Although the nitrite test in any given culture has given a definite end reaction, it is desirable of course, to know whether or not duplicate inoculations would give anomalous results such as frequently occur in the sugar fermentation tests. Some data upon this point were obtained in a series of inoculations to test the possibility of shipping uniced samples for fermentation tests. The iced sample was examined in the usual manner and then allowed to stand at summer temperature—about 20° to 28°.

At the end of 24 hours a second tube of nitrite media was inoculated and analyzed after a 48 hour incubation period. There were 22 agreements in 24 tests.

SUMMARY.

Analyses of bacterial cultures of water samples by the usual sanitary chemical methods, afford a basis for the theoretical interpretation of results and for the development of the analytical procedures which are in current use.

Aside from any inaccuracies of the Nessler process as used in ordinary routine work, the presence of free ammonia does not indicate the presence of intestinal bacteria. The determination of the ammonia might serve as a quantitative test for bacteria, but such a method would be inferior to direct cultivation by the usual bacteriological procedures. No general rules can be adopted. In certain large classes of water supply, the free ammonia determinations are without value.

The analyses of cultures also afford a laboratory method for distinguishing, in a given sample, between end-products, especially free ammonia and nitrites arising from bacterial putrefaction and the same products occurring as normal constituents of the soil.

The ordinary chemical determination of nitrites is, by itself, usually inconclusive regardless of whether or not nitrites are present. By the application of these culture methods, the nitrite determination has been developed so that it is applicable to practically all cases. This modification has been studied by theoretical experiments and by practical routine work with the following results:

1. It is apparently a very delicate and relatively specific test for intestinal bacteria.

2. Thus far the reaction has given very definite results free from anomalies. The test has been essentially a qualitative one and not dependent on careful quantitative distinctions.

In conclusion, further practical and theoretical investigation is especially desirable in connection with the determination of nitrites in cultures, such as experiments bearing on the specificity of the reaction, its delicacy in pure and mixed culture, and any alterations in the media leading to a reduction in the 48 hour time limit, in order to obtain a preliminary opinion.

AN OPINION UPON THE OUTBREAK OF TYPHOID FEVER AT ST. VINCENT'S INFANT ASYLUM, BALTIMORE COUNTY, MD., DURING JULY AND AUGUST, 1909.

By MARSHALL LANGTON PRICE, M. D.,
Baltimore, Md.

(ABSTRACT.)

Typhoid fever broke out at St. Vincent's Asylum during July and August, 1909. The first case occurred about the middle of July. Additional cases occurred up to September 24th. There were in all nineteen cases out of about one hundred and eighty children. Examination of the discharges of the cook and waitress disclosed that both were paratyphoid bacillus carriers. An atypical typhoid bacillus was isolated from the cook, which, however, agglutinated typically. The paratyphoid organism evidently played no part in the outbreaks as all of the typhoid patients gave typical Widal reactions.

A natural conclusion from this evidence alone would be that the cook was the source of the infection. A careful consideration of the evidence, however, did not support this view. The origin of the infection of the secondary cases was definitely traced to the water supply, a well, and it was later found that there had been a break in the sewer pipe between the end of July and the 15th of August and the well, upon analysis was found to be polluted. The author presents a considerable mass of evidence excluding the ice, the green vegetables, groceries, bread and milk from any aetiological relation. The author concludes either that the first case occured sporadically and caused the infection of the water, the carrier case being merely a coincidence or that the first case was infected by the carrier and the secondary cases arose through the polluted water supplies. The author's whole paper is intended to point out that it is equally as important in epidemiology as in judicial proceedings to consider the WHOLE evidence rather than a part, however suggestive, and not jump at obvious conclusions without mature and careful consideration of all the facts.

* Read before the Joint Session of the Section of Municipal Health Officers and the Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

REPORT OF COMMITTEE ON STANDARD METHODS OF PREPARING SMALLPOX VACCINE.

In the belief that the objects of the laboratories producing vaccine virus are simply to produce a safe and efficient virus, and that safety consists in the avoidance of extraneous, pathogenic infections, and that efficiency consists in the invariable production of a vaccine vesicle at the site of the inoculation of the virus in a previously unvaccinated person, standard methods may be considered to be any which have, in the experience of the Committee and their advisors,—the directors of the various laboratories of this country,—tended uniformly to the production of such virus, and which are approved by the United States Public Health and Marine Hospital Service.

The methods include:

1. The choice of a vaccinifer. While it is recognized that the communication of syphilis by the use of vaccine taken from the human vaccinifer has been of exceedingly rare occurrence, yet its possibility makes the use of this sort of vaccine distinctly inadvisable. As safe and efficient virus can be produced from a large number of animals, the Committee simply reports that commercial reasons usually give the preference to the bovine species, and that no reason exists for limiting the choice of animals to those of any particular age, sex or color. The value of rabbits as vaccinifers has been emphasized by Voight, Calmette and Guerin, and the use of these animals has been studied by your Committee, more especially by one member, Dr. A. W. Williams.

The method adopted to procure a practically pure, very active virus from a rabbit is the following:

"A delicate-haired rabbit is chosen and the hair is carefully clipped off a large area of the side and abdomen. This area is closely shaven and slightly scarified; germ-free virus is then thoroughly rubbed on. The animal is kept in a germ-free cage with raised wire floor through which excretions may pass. For

* Read before the Laboratory Section of the American Public Health Association, at Richmond, Va., October, 1909.

food, one thoroughly cleaned carrot is given each day for the four days the animal is kept. On the fourth day the animal is killed by chloroform. Before curetting the virus, the whole animal is wet with 5% carbolic acid, and a layer of cotton wet with the same germicide is placed over the inoculated area and allowed to remain for three minutes. The area is then washed with sterile water and the vaccine is collected under sterile precautions by a deep curettage of the infected area. The curetted material is immediately weighed and placed in a small measured quantity of the glycerine-water-carbolic mixture and thoroughly rubbed up with the curette. In this way more vaccine pulp is collected than by curetting the animal alive, and the resulting vaccine may be free from extraneous organisms. In fact, from four rabbits done in succession in this manner not one collection showed any growth from the virus contained in a platinum loop of moderate size planted in agar and plated immediately after the emulsion was completed. The emulsion is diluted to the quantity desired and may be passed through a layer of fine filter paper to rid it of the coarser pieces of tissue. Such a germ-free emulsion may be used at any time within a few weeks, on a calf or on human beings, with most satisfactory results."

It should be noted with reference to rabbit virus that it is claimed that there are more vaccine organisms in a given quantity of pulp than in the same quantity of calf virus, and that, therefore, a thinner emulsion may be used if desired. With rabbit virus there is little if any danger of infection from tuberculosis, foot and mouth disease (?) and syphilis, and the care of the animals is comparatively simple and inexpensive. It is, of course, true that only a moderate amount of pulp can be collected from a single rabbit. The amount of pulp taken from one hundred rabbits averaged 36 centigrams,—the maximum amount from any rabbit was 150 centigrams, and the minimum 10 centigrams; as yet no effort has been made to determine the largest amount possible. With the dilution adopted, 1 to 8, there was thus an average of 3 c. c. or 150 to 160 vaccinations per rabbit. The use of rabbits, both to assist in testing the potency of virus, and to aid in providing seed virus, has become habitual in one of the laboratories under the observation of the Committee, but for economical reason these rabbits have not

been killed at collection, but the vaccinated areas has been washed with five per cent. carbolic acid, followed by sterile water, and then curetted. Our experience with the use of rabbit virus as a seed has shown that the best results are obtained by using the rabbit seed not later than a week after collection. Out of twenty-five consecutive calves vaccinated with fresh rabbit virus not one failed, while out of the same number vaccinated with bovine virus six failed, and with human virus three failed to furnish a pulp yielding 100% of success in primary vaccinations. A fair comment, however, would be that the proportion of failures with bovine and with human virus was unusually large. It has not infrequently happened that a series of fifty calves vaccinated with bovine seed has not presented a break in the perfect efficiency of the resulting virus. The calves vaccinated with rabbit virus showed very slight contamination, less as a rule than that present after other seed.

2. The care of the animal. The Committee endorses entirely the rules of the Marine Hospital Service that only healthy animals shall be used to propagate vaccine virus; that they shall be under daily veterinary inspection for not less than seven days immediately before they are vaccinated; that they shall be killed or rendered insensible to pain before the vaccine material is collected; that a necropsy shall be made upon each animal, and that records of this shall be kept.

3. The choice of seed. The seed should be safe and efficient virus and may be from any source producing such. The experience of the past year in the epidemic of foot and mouth disease, originating in the use of infected seed employed in the vaccination of animals, is instructive as to the need for the most intimate knowledge of the source and safety of all seed used. The special value of rabbit virus for seed may be affirmed at this point. Rabbits are not included in Salmon's list of animals subject to foot and mouth disease, and in a recent epidemic of this disease, rabbits were exposed and did not contract the infection.

4. The material collected. The virus may be taken from any part of the vaccine vesicle or may be serum, which exuding from the base of the vesicle, brings with it the vaccine organism.

5. The technique of collection and of treatment. Any clean way of collecting the virus is admissible, and the Committee endorses the rule of the Marine Hospital Service that containers, grinding and mixing machines, filling apparatus and instruments that come in contact with vaccine material during the process of manufacture and preparation for the market, shall be sterilized before use, and endorses the requirement that the process shall be one known to be capable of destroying tetanus spores. The Committee further endorses the rule of the Marine Hospital Service in opposition to the manufacture of dry vaccine points.

The virus when collected should be mixed with some clean diluent, and this may, or may not be combined with some antiseptic. The amount of dilution to be recommended has been studied by the Committee, and it notes that dilutions vary in the material used as excipient and in the proportions of virus to the excipient. The excipient has in the history of vaccine production been somewhat varied. Lanolin, suggested and used in the hot climate of India, has also been successfully used in this country, but the distribution of pulp through paste is not easily made uniform, and the commercial distribution of the resulting product is not so economical and simple as when the product is a liquid. Glycerine has long been, and still is the most used excipient, and at the present time is generally mixed with some preservative.

The degree of dilution is influenced by two factors,—the ease of handling the product and the economy of the pulp, and is limited in amount by the efficiency of the resulting emulsion. The pulp cannot be readily used in vaccination, or practically distributed in the usual capillary tubes without some mixture,—that is dilution with some excipient, but the amount of such excipient may be so small as merely to equal the amount of the pulp. Assuming a vaccine emulsion, physically capable of being distributed in capillary tubes, the emulsion may be diluted, and, for the greatest economy of production should be diluted, to the greatest degree consistent with efficiency of the product.

A considerable number of reports have appeared at various times, giving instances in which extremely high dilutions have been efficient, and your Committee have observed instances of

successful "takes" with vaccine diluted as high as one to five hundred, but such success is accidental, a curiosity, and has no importance in determining the suitable degree of commercial dilutions. The pulp collected from one animal is more concentrated, and therefore capable of considerably greater dilution, than that collected from another animal, and the possible amount of dilution of the individual collection can therefore be determined only by experiment. For practical use it is necessary to ignore the individual variations and to insist that the dilution should have 100% of success in a large number of cases with every lot of virus.

It should further be noted that a high dilution, initially efficient, fails somewhat more rapidly than a low dilution. Collections, however, made from long series of animals and diluted in varying proportions have shown that dilutions of one part by weight of pulp to ten parts of diluent are both efficient and capable of maintaining their efficiency for the period of three months.

It is customary abroad to issue virus in dilutions varying with the laboratory from one to three to one to seven parts, and only exceptionally is the dilution of one to ten adopted. In this country, so far as the Committee has learned,—rarely is the dilution of one to eight exceeded, and to this perhaps unnecessary concentration, which is used as a safeguard to efficiency, there can be no objection.

Rabbit virus, it should be said, is capable of at least as great dilution as calf virus, and, there is some reason to think, of greater dilution, and the duration of efficiency of rabbit virus is not less than that of calf virus, diluted to the same degree. As a routine in the laboratory before mentioned calf virus is diluted 1 to 4, and rabbit virus 1 to 8. Rabbit virus diluted 1 to 10 has repeatedly continued efficient four and one-half months.

The Committee has noted that while both pure glycerine and glycerine diluted with water with or without an antiseptic form with vaccine pulp an emulsion, which continues for a considerable time unaltered, there is eventually a separation, the more solid pulp sinking to the bottom of the container, and the liquid diluent remaining nearly clear at the top. To avoid this separation the Committee has studied the value of other emulsifying agents, solutions of acacia in various percentages, of 2%

Irish moss, and of liquid vaseline, and has found that while a 25% acacia solution holds the virus in suspension a longer time than the glycerine solution, all the other mixtures tend to hasten the separation. The acacia solution, however, has the disadvantage of coagulating and solidifying in a short time after exposure to air and its adhesive properties hinder its use when capillary tubes are to be filled. The Committee has, therefore, no diluent to propose as a substitute for glycerine, and no method to postpone the separation.

6. Preservation of the virus. It is the opinion of the Committee that virus should be expected to maintain its efficiency for at least three months, but the best conditions for preservation of vaccine virus are not yet known; there is, however, no doubt that the efficiency of virus is better maintained at a temperature below 0 degree C. than at a temperature above that. Elgin's experiments tend to prove that efficiency is nearly perfectly preserved at —10 degrees C. Experiment has shown that the upper limit of temperature in which vaccine virus may live for one minute is 60 degrees C., and the lower limit has not been determined. The temperature of liquid air does not kill it.

The sudden failure of a previously efficient virus, an experience of every laboratory, is still unexplained. It has been suggested that the acidity of certain makes of glycerine is influential in destroying virus, but the Committee has experimented with the addition of varying percentages of acetic acid on the one hand and of potassium hydrate on the other to vaccine virus, and has found that an acidity of ½ of 1 % and an alkalinity of ¼ of 1% are unimportant.

The growth of some inhibiting organism has also been suggested as a cause for sudden failure, but your Committee has found that when virus which has failed rapidly has been mixed with efficient virus the mixture has usually proved efficient. If inhibiting organisms were the cause of the injury it would seem probable that they would effect the mixture as well as the original emulsion.

7. The tests of the virus. It is the opinion of the Committee that the appearance of the vaccinifer, though it may be suggestive, is never decisive as to the character of the virus collected, and that the determination of the safety and efficiency of the

virus must be the result of tests made on the virus. It is now realized that contrary to former belief, glycerine, while an admirable diluent, cannot be depended upon to free vaccine from all extraneous organisms, and further that the presence of many such organisms is in no sense a proof that the virus is unsafe, or that it will be attended by unusual inflammatory reaction on inoculation. Great freedom from organisms affords, however, a presumptive evidence in favor of the safety of the vaccine, and should therefore be one of the aims of every laboratory. It should be pointed out, however, that while it is a simple matter to free virus nearly completely from extraneous organisms there is danger that the process adopted may injure the efficiency of a virus. On account of the suspicion that pure glycerine injures virus, it is the custom in many laboratories to dilute the glycerine with water or with normal salt solution, and various substances,—chloretone, sodium bi-borate, boracic acid, toluol, potassium cyanide, chloroform vapor, and carbolic acid have all been used as antiseptic preservatives. The Committee has made no comparative study of these preservatives, but its members have tested some of them. Rosenau has pointed out that 50% glycerine will restrain all bacterial growth and that on less than this percentage no dependence can be placed for the preservation of vaccine. Glycerine has practically no effect on endogenous spores. Elgin has experimented with toluol after Carini's method, and found that the antiseptic produced a bacteria-free mixture, but has not been certain that the virus was not injured by the process. The Committee has observed that 1% carbolic acid in glycerine does not shorten the duration of efficiency of vaccine virus to a point less than the practically necessary period of three months, and that the bacteria disappear from virus so treated in a comparatively short time. Out of 50 consecutive lots of vaccine so treated everyone showed no growth on culture in 28 days, 12 were found sterile in 7 days, 19 in 14 days, 13 in 21 days, and the remaining 6 had become sterile by the 28th day; only 5 out of the 50 showed more than 100 colonies at the first count. The seed virus was not found to affect the number of colonies. The rapidity with which virus is freed from extraneous organisms is dependent in some measure on the temperature to which it is exposed.

Inasmuch as it is generally acknowledged that the appearance of the vesicles on the vaccinifer does not indicate accurately the efficiency of the virus taken from them when used in human vaccination, it is the custom in many laboratories abroad and in this country to test the virus before issue, by inoculating it either on a calf, a rabbit or a guinea-pig, or on persons previously unvaccinated. For example, to give instances in the knowledge of the Committee, the Mulford Company and the Alexander Laboratories make a potency test on calves; Parke, Davis & Co., on guinea pigs, heifers and persons; National Vaccine Institute on calves and persons; Lederle Laboratories on children; and the New York Health Department on children and rabbits.

When calves are used the appearance of the vesicles formed on linear incisions or on scarifications carefully made and uniformly inoculated is usually regarded as the test. When rabbits are used an exceedingly dilute emulsion, 1 to 50, in the New York Health Department Laboratory, is applied to the shaved surface and reckoning is made of the number of vesicles as well as their condition. When children are used, a number are vaccinated and the number and appearance of the vesicles is noted. It is obvious that when vesicles can be counted a percentage scale of efficiency is possible, but about the value of this and in general about the value of the different methods of making potency tests the Committee has no unanimous opinion, and it is a fact that virus given one rating by one of these tests may receive a different rating when tested in another way. The whole question of what deductions can be made from the usual efficiency tests is *sub judice*, and it is hoped may be examined during the coming year.

The Committee notes the regulations of the Marine Hospital Service that every lot of vaccine virus shall be examined to determine its freedom from pathogenic micro-organisms, but it also observes that there is not yet any agreement as to what shall constitute the minimum requirement as to the tests and as to the pathogenicity of the contaminating organisms. It is apparently customary for the laboratories in this country to plate cultures of the virus and to count and inspect the colonies; it is also the practice of many laboratories to inject virus, in amounts varying with the laboratory, into guinea pigs or rabbits. It is the pur-

pose of your Committee to consider during the coming year the variety and usefulness of bacteriological tests with a view to making recommendations at a later date.

The Marine Hospital Service rules also that a special examination must be made of every lot to determine the absence of tetanus, and, recognizing the singular importance of this requirement, the Committee has paid special attention to the bacteriological tests for the presence of tetanus in the virus, and has made inquiries relative to the methods and findings of the licensed laboratories producing vaccine in this country. The Treasury Department has issued licenses for the sale of vaccine virus in interstate traffic to Parke, Davis & Co., H. K. Mulford Company, Dr. H. M. Alexander & Company, Fluid Vaccine Co., Cutter Analytic Laboratory, National Vaccine and Antitoxin Institute, Lederle Antitoxin Laboratories, and Institut de Vaccine Animals of Paris.

The Committee has added to this list for investigation the Massachusetts State Board of Health Laboratory and the New York City Health Department Laboratory.

Because the Committee learned only recently that the Paris Institut has a license no information has been sought from it, but the other laboratories have reported their methods and they are given in the following statement:

Parke, Davis & Co.: "To detect tetanus germs a small quantity of the vaccine is planted in one litre of glucose bouillon. This is placed in the incubator for two weeks. At the end of time it is filtered through a Berkefeld filter and 2. c. c. are injected into each of two guinea pigs, the pigs being kept under observation for ten days. If they remain healthy during that time, we conclude that the product is not contaminated with tetanus."

H. K. Mulford Company: "The method is to grow two c. c. of vaccine anaerobically in a modified Smith tube containing a small quantity of fresh liver or spleen for seven days or longer, examine it microscopically for organisms resembling tetanus, and whether such is present or not the culture is filtered for toxine, and 5. c. c. of the filtrate is inoculated subcutaneously into a 300 gram (or over) guinea pig; the pig is inspected daily for ten days or longer, and must show no signs of tetanus. Should it die from other cause the test is repeated. This tetanus

test is repeated in another manner by another department; end-spore organisms have been found on several occasions."

H. M. Alexander & Co., Biologic Laboratories: "Tetanus tests were formerly made by inoculating a fermentation tube with the vaccine and subsequently injecting guinea pigs with its contents. For the last three years the vaccine has been tested by placing one-tenth of a cubic centimeter in a test tube containing about 5 c. c. of recently sterilized standard beef bouillon. A layer of liquid petroleum one-half to three-quarters of an inch thick is poured on, and the whole placed in an incubator at 37 degrees for 96 hours. The test tube is then shaken and two guinea pigs are injected subcutaneously, each with 1 c. c. of the cloudy liquid. At least two tests for tetanus are made on every lot of vaccine."

Milwaukee Fluid Vaccine Institute: "The contents of ten vaccine tubes are inoculated subcutaneously into a guinea pig and an anaerobic culture is made, using the contents of 25 tubes. 2. c. c. of the filtrate from this anaerobic culture, after seven days' growth, is injected beneath the tail of a mouse, and this animal as well as the guinea-pigs, are carefully watched for symptoms. The anaerobic culture is also examined morphologically for tetanus bacilli. We make three such tests on every number of vaccine that is put out from our laboratory."

Cutter Analytic Laboratory: "Our method is to add 1 c. c. of the glycerinated virus to bouillon in Einhorn Fermentation tubes, thoroughly mixing and incubate from 4 to 6 days. Then trikresol is added to about 0.5% and allowed to stand 24 hours, and about 3 c. c. of this is then injected intraperitoneally into a guinea-pig (about 300 gm. pig) and this is observed for 4 to 6 days. The trikresol is added, in the belief that it kills any undesirable bacteria that may be present, leaving the tetanus toxin or spores active if either be present. As a verifying test, bouillon in tubes, to which 1 c. c. vaccine has been added, is covered with a layer of sterile white paraffin oil, incubated and injected as above. The odor of each test is noted."

National Vaccine and Antitoxin Institute: "First, our lymph stands in glycerine salt solution for from 6 to 8 weeks, at the end of which time it is ground and glycerine added. Cultures are then made in bouillon, agar plates and fermentation tubes and

the number of bacteria shown are then recorded. The ground lymph is then allowed to stand in the ice-box for from 3 to 6 weeks. Cultures are then made by adding at least ¼ c. c. of the lympth to fermentation tubes containing 1% dextrose bouillon. Deep agar tubes are inoculated with the same quantity. Two agar plates are also made at this time. These cultures are allowed to stand in the incubator from one week to ten days, at the end of which time microscopic examinations are made, and if anything the least suspicious is found guinea pigs are inoculated from the suspected culture. In the majority of cases where the fermentation tube is used there has been previously added a small bit of sterile tissue from a healthy guinea pig."

LEDERLE ANTITOXIN LABORATORIES: "Our routine method for examining virus for tetanus consists in the inoculation from each calf's product of three fermentation tubes containing bouillon. These tubes are grown both at room and incubator temperature. The necessary anaerobic conditions are produced by the growth of the aerobic bacteria in the virus, in the open end of the fermentation tube. At the end of about four days, mice or rats are injected with this culture at the root of the tail and guinea-pigs receive ½ to 1 c. c. of this culture directly in the peritoneal cavity."

MASSACHUSETTS STATE BOARD OF HEALTH: "The fermentation tube containing bouillon and sterile tissue of a guinea-pig is used to detect the presence of anaerobes."

NEW YORK CITY HEALTH DEPARTMENT LABORATORY: "An anaerobic culture is made from one capillary tube of vaccine virus by the pyrogallic acid method and incubated for 6 days. The culture is then filtered through a Berkefeldt filter and ½ c. c. of the filtrate is injected into a guinea pig, which is kept under observation for nine days. Then if the pig shows no symptoms the virus is considered to be free from tetanus."

It will be observed that the methods described differ in (a) the amount of vaccine virus used in the test, (b) the method of making an anaerobic culture, (c) the length of incubation, (d) the use of culture or of filtrate for test, (e) the choice of test animal, (f) the amount injected and (g) the length of time the test animal is kept under observation. It is the belief of the Committee that some of the points of difference present opportunities for wise

recommendations of standard methods, and it is the hope of the Committee to present such recommendations at a later date.

It is to be noted that no laboratory has yet discovered tetanus in the vaccine tested, and the hygienic laboratory of the Marine Hospital Service, which has for a considerable time examined specimens of virus from various sources, has not yet found tetanus. The only instances, which have come to the knowledge of the Committee, in which tetanus has been found in vaccine virus, are those reported by Dr. R. N. Willson, of Philadelphia, and Dr. A. Carini, of Berne; the former discovered probable tetanus once, but declines to consider it scientifically established. Carini reports finding tetanus five times in four hundred examinations of 50 different specimens of virus. The reports of the number of tests from the various laboratories aggregate over five thousand eight hundred in which no tetanus was found. Inasmuch as it has been shown that while calves are insusceptible to tetanus their feces contain tetanus bacilli in about 8% of cases it would not seem remarkable if this particular infection were found occasionally present as a contamination. One of the Committee has shown that the 50% glycerine usually used for diluting virus is sufficient to prevent the growth of tetanus. Unless therefore, tetanus virus grows in the vaccine vesicles of the calf, a point on which we have as yet no information, it may probably be fairly assumed that any tetanus in vaccine is present as an accidental contamination, and not as a culture, i. e., tetanus germs if present, are in small numbers and not in large numbers.

The Committee has made some attempt to learn the approximate number of tetanus bacilli required to kill a guinea pig on subcutaneous injection. This has been done by determining the minimum fatal dose of a 6 day tetanus bouillon culture, and then counting the bacilli present. The results have not been entirely accordant and are not in condition to be reported, but with a consideration of the minimum number found in a fatal dose it is apparently evident that such a dose of pure culture must contain several thousand bacilli. Previously published experiments made to determine the limit above which it is practically easy to demonstrate the tetanus germs in vaccine emulsion resulted in showing that there is little certainty of demonstrating tetanus by ordinary cultural methods unless there is as large an amount

of tetanus present as would be expressed by six loops of moderate size taken from a 48-hour tetanus culture and added to ½ c. c. of glycerinated virus. As these experiments also included the injections of white mice, and the vaccination by scarification of white mice, guinea pigs, and monkeys with these mixtures of tetanus and vaccine it may also be inferred from the results of the experiments that test animals are not affected unless a considerable number of tetanus bacilli is inoculated.

The Committee endorses every precaution which may lead to the greater security of a virus against tetanus contamination, but is of opinion that so far as experiments yet made permit a conclusion, the danger of tetanus infection from vaccination with any vaccine virus issued from a laboratory using methods customary in this country, is negligible.

The Committee would report the cordial attitude of the vaccine laboratories of this country to the Committee's work as expressed by courteous and full replies to interrogatories and requests for assistance.

As is well known, the twenty-two vaccine laboratories in Germany make reports, which are consolidated and appear annually in the MEDIZINAL-STATISTICHE MITTEILLUNGEN AUS DEM KAISERLICHEN GESUNDHEITSAMTE. This general report, which is most detailed, describes the individual laboratories and gives the cost of maintenance and the production of each. It also states the exact methods of caring for the animals, the methods adopted in vaccinating the animals and collecting virus, the seed virus used, the methods of preparing and distributing the virus collected, and notes all experimental work and scientific observations made during the year in each laboratory. Such a report could have no exact counterpart in this country, in which the laboratories are usually conducted by private enterprise, but it would undoubtedly be helpful both in establishing a uniform high level of work and in contributing to the advance of the art of vaccine production if the various laboratories of the country would report to some central body certain facts, such as the seed virus used, the method of preparation of the pulp collected, the dilution, the excipients and preservatives used, the bacteriological and efficiency tests practically carried out by the laboratory,

and would further add some note of any experimental work or scientific observations made during the year.

It is the opinion of the Committee that if the American Public Health Association would extend an invitation to furnish annually such statistics and reports as those mentioned for publication in the proceedings of the Association the Vaccine Laboratories of this country would probably accede to the request, and the Committee therefore recommend that the Public Helath Association extend such an invitation.

J. H. HUDDLESTON, Chairman.
W. F. ELGIN,
S. H. GILLILAND.
A. W. WILLIAMS.

REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE DIAGNOSIS OF RABIES.

In accordance with the plan outlined in the report for 1908, a slip containing a comprehensive outline of points proposed for investigation in this work was sent to each of thirty-nine stations throughout the world where rabies work is being carried on, with the request that a reply be sent to the Chairman of this Committee, stating the work done at such stations and an opinion of the work proposed by this Committee. Twenty answers have so far been received.

Since only half of the stations have responded and since the list of stations is not quite complete, this Committee thinks it best to wait for further reports before giving data from these replies.

From recent work published, however, as well as from the replies already sent in the Committee feels justified in allowing the working method for rabies diagnosis published in last year's report to stand as representing in general the present opinion as to the best method to be used, until further work increases our knowledge on the subject.

The following points recommended for immediate consideration by members both of the Advisory and the regular Committees should be specially studied during the coming year.

1. Comparison between virulence of saliva and brain and of time the Negri bodies appear in brain.

2. Public attention directed to importance of keeping biting animals under observation, only killing in case of need of immediate protection against an otherwise uncontrolled animal.

3. Length of time such suspected animals should be kept.

4. Advice to give users of milk from infected cow. Here should be determined what percentage of infected cows have infected milk, and degree of infection of such milk.

McDaniel and Wesbrook determined the virulence of milk from one rabid cow.

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

5. Simplify method of diagnosis. (Of course the points mentioned in our scheme for study are not to be carried out in each case in routine diagnosis. They are simply points for investigation in order to shorten our routine methods).

6. Localization of well developed bodies. For instance, in a certain percentage of rabid cases well developed bodies are found in the cerebellum and not in Ammon's Horn.

7. Number of smears studied in doubtful cases before deciding that the case is not rabies.

Is it true that in one well made smear from any part of gray matter of brain at least suspicious changes may be found if the case is rabies?

8. Relative value of rabbits and guinea pigs for the inoculation test.

ANNA W. WILLIAMS, Chairman.

PRELIMINARY REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE BACTERIOLOGICAL DIAGNOSIS OF TUBERCULOSIS.*

The diagnosis of tuberculosis by bacteriological methods in the laboratory can be made in four different ways: First, and most important, the examination of sputum; second, the examination of urine; third, the examination of pus and other discharges; fourth, the examination of tissues. These will be considered in the order given.

FIRST. We recommend that laboratories supply outfits for collecting sputum, consisting of a wide mouthed bottle containing about 30 c. c., with a cork stopper, and suitably packed for mailing. It is better to put 3 to 5 c. c. of 5% solution of carbolic acid in each bottle. Enclosed with the bottle is a leaflet giving directions for collecting sputum, and blank for the name of the physician sending in the case, the patient's name, date of collection, and other data which circumstances in the laboratory render important. The directions for collecting sputum are as follows:

The first sputum raised in the morning is preferred. If this expectoration is scanty, save the entire amount coughed up in twenty-four hours. Be careful to avoid the contents of the stomach, particles of food, etc. Give only what is coughed up from the lung. Be sure that the cork is tightly inserted into the bottle and that the outside of the bottle is well washed off before packing.

We believe that public health laboratories should undertake the first three of these examinations as a matter of routine. However, we recognize that tuberculosis is spread chiefly by means of sputum. The examination of the other materials must be determined by the facilities of any given laboratory.

Directions for collecting urine: This should always be done by a physician or competent nurse. Great care should be taken to wash the meatus thoroughly, and the urine should be drawn with a sterile catheter into a sterile bottle (rubber or glass stop-

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

per), with the utmost precautions to avoid contamination, and sent at once to the laboratory. If from a distance it should be packed on ice.

THIRD. Directions for collecting pus. Pus from a freshly opened abscess is to be preferred. If an old sinus exists it should be scraped with a dull curette, and the scrapings be sent with as much pus as possible. Sputum bottles are convenient for the transportation of such material, but the carbolic acid should be washed out with sterile water.

FOURTH. Tissues should be sent in sterile gauze packed on ice.

Examination of sputum. For staining, carbol fuchsin is recommended. For decolorization, a mixture consisting of 5 parts nitric acid and 95 parts of 95% alcohol is the most convenient. Those preferring it may use any of the mineral acids up to 10%, but we advise against very strong solutions of acid. At least ten bacilli should be found before calling any specimen positive. Should the specimen prove negative by this simple examination it may be digested with 2% caustic potash solution then centrifugated and the sediment examined.

For routine work the slide or cover slip after being spread should be completely covered in carbol fuchsin and heated gently until vapor shows itself for 5 minutes before decolorization. If bacilli are not shown by this method, the slide should be immersed for twenty-four hours in cold carbol fuchsin. We find that where the number of bacilli is small this is a much more certain method of revealing them than the rapid stain.

Pus is to be examined in the same manner.

Urine should be centrifugated, the supernatant fluid poured off, distilled water added, and a second centrifugation done. This is best repeated three times and the sediment finally examined as for sputum. Special care must be exercised in fixing the sediment, however. If dried slowly the danger of washing off is largely avoided.

In examination of all material it may be necessary to resort to animal inoculation. We wish especially to emphasize the importance of this procedure in cases of suspected genito-urinary tuberculosis, where it is often imperative.

For the examination of tissues the methods given by Mallory and Wright are perhaps the best. (Pathological Technique.)

The routine differentiation of the tubercle bacillus from the smegma bacillus is best made by the method of Dahms, (J. A. M. A. April 28, 1900), but animal inoculation should be resorted to in doubtful cases.

During the past year there has been published by Fontes a staining method for the differentiation of true tubercle bacilli from the other members of the acid-fast group. This has been found very efficient, and we recommend it in doubtful cases. (Cent. b. I Feb. 26, 1909). We append it with notes of our experience.

a. Stain preparation by ordinary carbol fuchsin method.

b. Wash in tap water.

c. Stain about 2 minutes with carbol crystal violet (carbol gential violet gave better results in our hands.)

d. Treat with Lugol solution until no more metallic mirrors are found. (Decolorization is more easily effected if at this point the preparation is blotted thoroughly).

e. Treat with Aceton alcohol. (Equal parts of Aceton & Alcohol).

f. Wash in distilled water.

g. Stain with methylene blue.

Mazyck P. Ravenel, M. D., Chairman.
Harold C. Ernst, M. D.
B. L. Arms, M. D.

SECOND PROGRESS REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE BACTERIAL EXAMINATION OF WATER AND SEWAGE.*

Since the printing of the last report, the Committee has devoted itself to a study of the special points referred to in that report and to a consideration of other questions which have arisen in the meantime relating to the Bacterial Examination of Water and Sewage. It has also been in consultation with the Committee on the Chemical Examination of Water and Sewage and has concluded with them that a revised edition of the Standard Methods of Water Analysis should be printed in 1910.

It is now thought desirable to revise and reprint editions of the Standard Methods once in five years, and, in the interim, to issue progress reports giving observations on new methods and proposed changes in the methods now recommended.

The year 1910 marks the first five year period, and the first six months will be devoted to the compilation of the new edition, which will, as in the last publication, include the combined work of the chemical and bacterial committees.

It is earnestly desired that all members of the laboratory section of the American Public Health Association, and any others who are interested in the standardization of our methods, shall send to the chairmen of these two committees any data or observations bearing on new methods or proposed changes or improvements in the existing standards. Due credit will be given for all work, whether previously published or not, and complete references will be made.

In addition to the recommendations made in the progress report of last year, the following changes and additions should be considered:

Sterilization. A lactose medium sterilized thirty minutes in the autoclave, at 120° C. will give a positive test by gas forming bacteria which ferment dextrose but do not ferment lactose.

In the sterilization of media containing lactose, care should therefore be taken that the media to be sterilized are not sub-

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

jected to the temperature of 120° C. (15 pounds pressure), longer than fifteen minutes, as after that time inversion to dextrose begins to take place.

INCUBATION. The question of whether or not the temperature of incubation should be 37° or 40° is still open and there seems to be much difference of opinion on the subject.

PRELIMINARY CULTIVATION. The period of preliminary cultivation, at 37° C., should be changed to read from 12 to 24 hours, to attain the greatest degree of vitality. Liver broth appears to be a better medium for general preliminary cultivation than beef broth. This is not only true in work on species, but in the preliminary cultivation for the determination of the presence of *B. coli*, where attenuated forms as well as the stronger types are desired.

DESCRIPTION OF SPECIES. The regular card of the Society of American Bacteriologists is recommended for use, but the desirability of the catalogue system of numbering species is still under discussion.

DEXTROSE BROTH. Dextrose broth made with Liebig's Beef Extract is not equal in effectiveness to that made of fresh beef extract and should not be substituted for the latter.

AGAR MEDIA. It has been found that agar stab cultures keep better when 15 grams of agar per litre is used. Plate cultures should be made with 10 grams of dry agar as recommended in last year's report.

LITMUS LACTOSE AGAR. More colonies and better general results are obtained on the litmus lactose agar plates, when the litmus and lactose are each sterilized separately and added to the plate with the neutral agar at the time of planting. Good results can, however, be obtained, if the agar and lactose are mixed and sterilized in an autoclave at 120° C. for ten minutes only.

LIVER BROTH. This medium has been developed during the past year and will be described during the present convention. It is made from a hot infusion of beef liver instead of fresh meat, and is, in other respects, the same as Dextrose Broth, but it is a richer food medium for bacteria. It gives gas formation on all species which ferment dextrose and develops attenuated bacteria, whether gas forming or not, to a better degree than does beef broth. It is also especially suited to the rejuvenation of species in pure culture.

Lactose Bile. This medium has been extensively studied during the year. It has been found to exert a mild inhibiting effect on *B. coli*, so that if the organism is attenuated it does not readily develop or may not develop at all.

On the other hand, it prevents overgrowths of other bacteria and presents few anomalies.

In the interpretation of the sanitary quality of a water, it is best to discount the presence of attenuated *B. coli* and to be sure to obtain all vigorous types. The lactose bile medium accomplishes both of these objects. If, however, the analyst desires to obtain all of the *B. coli* present and all of the gas formers other than *B. coli*, he should use liver broth as a medium.

Presumptive Tests for *B. coli*. The presumptive test for *B. coli* and all other gas forming bacteria growing at 37° C., may be best made by planting dilutions of the water (usually one-tenth, and one ten cubic centimeters) into liver broth and transplanting from these tubes into lactose bile within from 6 to 18 hours after incubation. This gives practically all *B. coli*, whether attenuated or otherwise.

It has been found, however, that a better interpretation of the sanitary quality of the water can be had by the results obtained from the use of lactose bile alone, as other gas formers and attenuated *B. coli* serve often to mislead in forming an opinion. It is certain that the presence of fairly recent contamination is the point to be determined for the purposes of proper interpretation. Another point is that its use is important if tests for *B. typhi* are to be made later on.

By planting dilutions of one-tenth, one and ten cubic centimeters of the water to be tested into lactose bile and also into liver broth and transplanting the three dilutions from the liver broth into lactose bile, we have a fairly complete presumptive test.

The dilutions of the original bile give the vigorous *B. coli* present. The liver broth dilutions give the amount of all gas formers present fermenting dextrose at 37° C. and the difference between the original and the transplanted lactose bile gives a fair idea of the attenuated *B. coli* present.

The other gas formers, if desired, may be readily isolated from the liver broth in the usual way. *B. sporogenes* is indicated in the liver medium by a strong distinctive odor.

The presence of certain types of streptococci are indicated by a heavy precipitate in the lactose bile medium.

SPECIAL TESTS ON *B. coli*. In the determination of *B. coli* by special tests, the fermentation of lactose should be considered of diagnostic value for the *B. coli* group.

Esculin media, especially the esculin bile broth, is of value in the determination of the presence of *B. coli* and has been studied during the year.

The Committee have found that the presence of bile salt is an advantage, as shown by comparisons made of its action with and without bile on the various gas forming bacteria. The test is more strongly marked when bile salt is present and *B. sporogenes* and several other species of bacteria, may give a positive result when bile is absent. While the esculin bile test is important, it has been found that a number of bacteria not in the *B. coli* group give positive results. The sodium taurocholate called for in the esculin bile medium, when obtained on the market, is practically all sodium glycocholate, but the action of the two salts is precisely the same so that wherever a formula reads sodium tauracholate, the glycocholate may be substituted.

ISOLATION OF SPECIFIC DISEASE GERMS FROM WATER SUPPLY. The time has now arrived when the isolation of specific disease bacteria from water supply has become a process not too difficult to be made a part of routine water analysis where any such germs are suspected to exist.

The isolation of the cholera germ has long been a practical matter, and the *Bacillus typhi* has been isolated by the method described at our last meeting by five different observers during the past year. It is earnestly desired that more work along these lines be carried on in the experimental laboratories and that methods be found for the isolation from water of paratyphoid bacilli and the various types of bacteria producing diarrhoea. The Committee will provide pure cultures to those wishing to work along these lines.

Respectfully submitted,

DANIEL D. JACKSON, Chairman.
WM. R. STOKES. FRED. P. GORHAM.
JNO. A. AMYOT. STEPHEN DE M. GAGE.

REPORT OF THE COMMITTEE ON STANDARD METHODS FOR THE PREPARATION OF TUBERCULIN AND MALLEIN.*

The Committee on Standard Methods for the Preparation of Tuberculin and Mallein respectfully submit the following report of progress:

As soon as possible after the appointment of the committee, its chairman obtained from each member a somewhat detailed account of his method of preparing tuberculin. As the chairman was more immediately interested in the old tuberculin he was guilty of directing his attention to its preparation more vigorously than to those of the so-called newer tuberculins. It is for this reason that the major part of this preliminary report deals with the preparation of the original tuberculin.

OLD TUBERCULIN.

The methods now in use by the different members of the committee, as well as by others, for the preparation of the old tuberculin differ, in minor details, from each of the others in varying degrees, while there is essentially a uniformity of practice concerning the more essential steps in the manufacture of this bacterial product. The methods of the different members were copied under a serial number and submitted to each member for suggestion and criticism. As one might naturally expect, each member indicated his own method as the one most likely to approach nearest to the ideal standard. This left the chairman with five very good methods for making tuberculin to be submitted in a further report for approval or rejection by the committee members. In order to have data for a just comparison the chairman has, to the best of his ability, carefully prepared tuberculin after each of the methods employed by the different members of the committee, with the result that thus far the tests show one method of preparation to produce quite as satisfactory tuberculin as the others.

* Read before the Laboratory Section of the American Public Health Association at Richmond, Va., October, 1909.

With the result stated, the problem before us seemed to be to ascertain whether or not the differences in the details of preparation are of any significance. This diverted the work of the committee to the realm of research to determine the true reason, if any, for each of the various steps in the preparation of the old tuberculin and what effect, if any, each ingredient in the medium had upon the quality of the product. For example, one or two members add acid potassium phosphate to the bouillon; others find this of no help whatever. One prefers veal while others employ beef for making the bouillon. The percentage of glycerin added varies 4% and the degree of alkalinity of the medium differs quite as widely. One member does not follow the time-honored procedure of concentrating the tuberculin to one-tenth of the original quantity and then diluting it back again after Koch's method, while others think this advisable. These and other differences in the details are not peculiar to this committee, for the literature shows, and personal conferences with several others who make tuberculin show, that these minor differences are wide spread. It would seem, therefore, that at present we should devote ourselves to finding, if possible, why these things are done, and perhaps determine if some simpler and more convenient procedure would be not only easier to follow but also give a more efficient product. Until these facts are determined, and until there is a more accurate method for testing the action of tuberculin, it seems to the committee that a detailed standard method of preparing the old tuberculin cannot wisely be prescribed. No one who makes a satisfactory product wishes to commit himself to, or accept for a routine practice, any method other than that which his experience has confirmed, unless there can be shown just and sufficient reason for it.

At this time your committee does not feel justified in recommending as a hard and fast procedure any specific routine of details to be observed. Your committee agrees, however, that certain fundamental principles should be strictly observed by all those who manufacture this form of tuberculin. These are:

1. The medium shall consist of bouillon prepared from meat (veal or beef) and not meat extract. The bouillon shall contain 1% peptone (Witte's), 0.5% sodium chloride or acid potassium phosphate, chemically pure glycerine 5% (this may

vary from 3 to 7%). The final reaction of the bouillon shall be 0.75 to 1.0 to phenolphthalein, the normal acidity of the broth being corrected by the addition of sodium hydrate solution.

2. The culture of tubercle bacillus employed shall be of mammalian origin and shall produce an active tuberculin.

3. The containers in which the cultures of tubercle bacilli are grown shall be in form similar to the Erlenmeyer flasks of the Jena pattern, preferably 300 c. c. capacity, each flask to contain 100 c. c. of bouillon.

4. The cultures should be allowed to grow for four weeks after the surface of the medium is completely covered with the growth of the tubercle bacillus.

5. In the preparation of the tuberculin the ripe cultures are shaken down, placed in a steam sterilizer and subjected to live steam for at least 2½ hours, filtered through paper, evaporated to one-tenth of original volume. Before being supplied to practitioners the tuberculin should be passed through Chamberland or Berkefeld filters.

6. Tuberculin should be sent out from the laboratory so that the practitioner need not dilute it before using. The dilutions when exposed to the air should not for human practice be prepared for any great length of time before use. The dilutant suggested is 0.25% phenol in physiological normal sodium solution.

The methods for testing the efficiency of tuberculin are not satisfactory. This renders it impossible at this time to determine the exact dose that should be given. There are many problems yet to be solved before we can with justice or even safety, insist upon some one chain of details to be observed in the preparation of tuberculin. Any action to fix a standard of procedure beyond the general principles mentioned would tend to minimize rather than strengthen the efficiency of tuberculin now available in the market or from our various state and government laboratories.

MALLEIN.

The preparation of mallein is attended with the same difficulties as that of tuberculin. The same questions relative to the why for the various steps in its preparation and testing that are

not answered for tuberculin are not answered here. While considerable attention has been given to the preparation of mallein, the investigations have not as yet given results to justify any further report at this time.

THE NEWER TUBERCULIN.

The committee is not prepared at this time to recommend a standard method for the preparation of the newer tuberculins such as Bacillen Emulsion, Tuberculin Residue, Bouillon Filtrate and others. Certain members of the committee have had little if any experience in the preparation of these products and ask that a longer time be given for their consideration before recommending a standard method of preparing the same.

As the questions assigned this committee deal largely with unexplained phenomena, a detailed report that can be recommended for general adoption is impossible until much necessary data can be derived from careful research and experimental work. It is recommended, therefore, that pending the recording of the required results the committee be continued, and that one additional member be appointed to facilitate the necessary work in connection with the newer tuberculins.

Respectfully submitted,

(Signed)

V. A. MOORE, Chairman.
S. H. GILLILAND,
M. DORSET,
M. P. RAVENEL
EDW. SCHORER.

PROCEEDINGS OF THE 37th ANNUAL MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION, RICHMOND, VIRGINIA, OCTOBER 19th to 22nd, 1909.

TUESDAY, OCTOBER 19TH, 1909.

FIRST DAY—MORNING SESSION.

The Association was called to order by the President, Dr. Gardner T. Swarts, at nine o'clock, a. m., in the Auditorium of the Jefferson Hotel, Richmond, Virginia.

The reading of the minutes of the preceding meeting was, by unanimous consent, omitted.

The Secretary then read the names of the applicants for membership, set forth below, and, on motion, was authorized to cast the ballot for all applicants named:

ACTIVE MEMBERS.

Mr. Geo. Kemple Armeling, Baltimore, Md.
Dr. Elmer Howard Best, Freeport, Ill.
Dr. Harry W. Blair, Mt. Vernon, O.
Dr. Wm. T. Bowman, East Orange, N. J.
Dr. J. A. Brandery, Montreal, Can.
Dr. Robert S. Breed, Meadville, Pa.
Dr. A. B. Briggs, Ashway, R. I.
Dr. R. G. Broderick, San Francisco, Cal.
Prof. Severance Burrage, Lafayette, Ind.
Dr. Chas. B. Carrington, Richmond, Va.
Mr. Edward S. Chase, Reading, Pa.
Dr. Albert Justus Chesley, Minneapolis, Minn.
Dr. Hyman Cohen, Chicago, Ill.
Dr. Theo. W. Corwin, Newark, N. J.
Dr. Jefferson C. Crossland, Zanesville, O.
Dr. Harry H. Crum, Ithaca, N. Y.
Dr. Gabriel Custadio, Havana, Cuba
Prof. Francis E. Daniels, Trenton, N. J.
Dr. Hasbrouck De Lamater, Kansas City, Mo.
Adrian De Garay, Mexico City, Mex.
Wm. F. Drewry, Petersburg, Va.
Ellis Madison Duncan, Birmingham, Ala.
Dr. Jas. H. Dunkley, Saltsville, Va.
Genaro Escalona, Mexico City, Mex.
Dr. Roy K. Flannagan, Charlottesville, Va.
Dr. Frank P. Foster, New York.
Mr. Lee H. Frankel, New York, N. Y.
Dr. Abram E. Frantz, Wilmington, Del.
Dr. Geo. E. French, Elyria, O.
Dr. Wade H. Frost, P. H. & M. H. S., Washington, D. C.

Mr. Richard H. Gaines,
New York, N. Y.
Dr. Geo. B. Gale, Newark, N. J.
Dr. Carlos Manuel Garcia,
Vera Cruz, Mex.
Alfredo de Gochicoa,
Port of Salina Cruz, Mex.
Dr. Joseph Goldberger,
Washington, D. C.
James L. Gordon, Richmond, Va.
Dr. Edward A. Gorman,
Alexandria, Va.
Dr. John P. Harrell, Burlington, Ia.
Frank Wilson Hachtel,
Baltimore, Md.
Mr. Henry M. Herbert,
Bound Brook, N. J.
Mr. Thos. G. Herbert, Altoona, Pa.
Dr. Edwin Govan Hill,
Manchester, Va.
Dr. A. Clark Hunt, Metuchen, N. J.
Mr. Chas. A. Jennings, Chicago, Ill.
Grandville R. Jones,
Washington, D. C.
Dr. Jefferson R. Kean, U. S. A.,
Washington, D. C.
Dr. John Walter Kerr,
P. H. & M. H. S.,
Washington, D .C.
Mr. John A. Kingsbury,
New York, N. Y.
Mr. Louis A. Klein, Phila., Pa.
Edgar H. Lancaster, Austin, Tex.
Dr. Samuel P. Latane,
Winchester, Va.
Dr. Charles N. Laurie,
Port Arthur, Ont.
Dr. Alfred G. Long,
Winnipeg, Manitoba.
Dr. Leslie L. Lumsden,
P. H. & M. H. S.,
Washington, D. C.
Dr. Thomas B. McClintic,
P. H. & M. H. S.,
Washington, D. C.
Dr. Patrick McGill, Superior, Wis.
Dr. Wm. J. Manning,
Washington, D. C.
Dr. Rawley White Martin,
Lynchburg, Va.
Dr. Harry Taylor Marshall,
University P. O., Va.
Antonio Matienzo, Tampico, Mex.
Mr. Oscar C. Merrill, Berkeley, Cal.
Dr. Robert Alston Mertin,
Petersburg, Va.
Col. W. F. Morse, New York, N. Y.
Mr. Harvey Mott, E. Orange, N. J.
Dr. Vernon Nesbet, Marietta, Pa.
Alfonso Rafael Ochoa,
Allende, Mex.
Dr. Wm. Tell Oppenheimer,
Richmond, Va.
Dr. Chas. W. Peck, Brandon, Vt.
Padro P. Perdro, Mexico City, Mex.
Dr. Frank Lester Pleadwell,
U. S. N.,
Washington, D. C.
Dr. Thomas Powell,
Los Angeles, Cal.
Dr. Isaac D. Rawlings, Chicago, Ill.
Mr. Frank Leslie Rector,
Brooklyn, N. Y.
Dr. Edward C. Register,
Charlotte, N. C.
Louis J. Richards, Elizabeth, N. J.
Dr. Mark Richardson, Boston,Mass.
Prof. John Woodside Ritchie,
Williamsburg, Va.
Dr. Milton J. Rosenau,
Brookline, Mass.
Dr. Marvin Pierce Ruckel,
Manchester, Va.
Dr. Richard Slee, Nanuet, N. Y.
Dr. Wm. F. Snow, Sacramento, Cal.
Dr. George W. Stiles, Jr.
Washington, D. C.
Dr. Quincey Orlin Sutherland,
Janesville, Wis.
Dr. Sterling B. Taylor, Columbus,O.
Dr. Henry Fletcher Tatum,
Meridian, Miss.

Leon Greenfield Tedesche, Cincinnati, O.
Dr. William Griffith Tice, Trenton, N. J.
Dr. Federico Torralbas, Havana, Cuba.
Dr. John Wm. Trask, P. H. & M. H. S., Washington, D. C.
Dr. Francisco Valenzuela, Mexico City, Mex.
Louis Van Es, Fargo, N. D.
Dr. Victor C. Vaughan, Detroit, Mich.
Prof. J. W. Votey, Burlington, Vt.
Ethel Marion Wade, Boston, Mass.
Dr. J. Howell Way, Waynesville, N. C.
Dr. Wm. D. Weis, Hammond, Ind.
Dr. Harry E. Welch, Youngstown, O.
Francis D. West, Holmesburg, Pa.
Dr. Wm. Johnson West, Richmond, Va.
Prof. Walter Francis Wilcox, Ithaca, N. Y.
Dr. Charles F. Williams, Columbia, S. C.
Dr. Bernard Wolf, Atlanta, Ga.

Associate Members.

Mr. Julian Curry Bosher, Richmond, Va.
Richard Caturegli, Mexico, Mex.
Arthur F. Estabrook, Boston, Mass.
Mr. Adolph Fisher, Elgin, Ill.
Royce W. Gilbert, Boston, Mass.
Mr. B. W. Hammer, Madison, Wis.
Isaac F. Harris, New York, N. Y.
Lester Clarence Himebaugh, New York, N. Y.
Dr. Ralph H. Hunt, East Orange, N. J.
Mr. Hubert Oliver Jenkins, Boston, Mass.
Dr. George Ben Johnston, Richmond, Va.
Dr. Stuart McGuire, Richmond, Va.
John Pierce Mitchell, Palo Alto, Cal.
Rev. Joseph Thomas Mastin, Richmond, Va.
Dr. Albert Nicholson Mueller, Rock Island, Ill.
Mr. Bernard Allane Parsons, Detroit, Mich.
Dr. James R. Scholl, Peoria, Ill.
Dr. Clarence Albert Shore, Raleigh, N. C.
Dr. George Adam Stover, South Boston, Va.
Aubrey H. Strauss, Richmond, Va.
Dr. Edward C. S. Taliaferro, Norfolk, Va.
Mr. Woolridge Thomas Tuck, Richmond, Va.
Dr. Alexander E. Turman, Richmond, Va.
Mr. Leon R. Whitcomb, Norfolk, Va.
Dr. Harold Bacon Wood, Philadelphia, Pa.

This list includes all members elected during the entire Richmond meeting, the Secretary not having kept a separate record of the members elected on each day.

On motion, the Association adjourned to meet at half past two o'clock p. m.

First Day. Afternoon Session.

The Association was called to order at half past two o'clock, p. m., by the President.

The following papers and reports were then read and discussed:

The Second Decennial Revision of International Classification of Causes of Death, by Dr. Cressy L. Wilbur. See p. 535, Vol. VI.

Report of Committee on Typhoid Fever, presented by Dr. H. W. Hill, Chairman. See p. 50, Vol. VI.

On motion of Dr. Price the report of the Committee on Typhoid Fever was accepted, and the Committee was continued for another year.

A Report of an Epidemic of Probable Para-Typhoid Fever, by Drs. Allen W. Freeman and Harry T. Marshall. See p. 14, Vol. VI.

The Prevention of Typhoid Fever in a City and in Country Districts, by Dr. Wm. Royal Stokes. See p. 24, Vol. VI.

The Control of Milk-Borne Outbreaks of Typhoid Fever, by Dr. C. V. Chapin, read by Prof. F. P. Gorham. See p. 29, Vol. VI.

Some of the Present Needs of the Association, by Mr. Burt R. Rickards. See p. 698, Vol. V.

Report of the Committee, appointed at the last meeting to consider the possibility of acquiring funds to further the efforts of the Association, by Prof. F. C. Robinson, Chairman. See p. 691, Vol. V.

The Utility of the Domiciliary Visit in the Struggle against Yellow Fever, by Dr. Carlos Manuel Garcia. See p. 54, Vol. VI.

The Campaign against Yellow Fever on the Isthmus of Tehuantepec, by Dr. Francisco Valenzuela. See p. 50, Vol. VI.

Report on Yellow Fever in the Mexican Republic from August 25, 1908, to Date, by Dr. Eduardo Liceaga. See p. 63, Vol. VI.

Some Efficient Means of Checking Syphilitic and Gonorrhoeal Contamination, by Juan Brena. See p. 518, Vol. VI.

Necessity of Isolating Syphilitic Prostitutes to Prevent the Propagation of Disease, by Dr. Joaquin Huici. See p. 523, Vol. VI.

Some Considerations Relative to the Transmission of Syphilis by Vaccine, by Dr. Francisco de P. Bernaldez. See p. 531, Vol. VI.

On motion, a recess was then taken until quarter after eight o'clock, p. m.

First Day. Evening Session.

The Association was called to order for the usual public meeting, at quarter after eight o'clock, p. m., by the President.

The meeting was opened by an invocation by Rev. Robert W. Forsythe, of Richmond, Virginia.

On behalf of the City of Richmond, an address of welcome was delivered by Hon. D. C. Richardson, Mayor.

On behalf of the Medical Profession of Virginia, an address of welcome was delivered by Dr. George Ross, of Richmond, Virginia.

Responses were made on behalf of the United States, by Prof. Franklin C. Robinson (see p. 589, Vol. VI.); on behalf of the Dominion of Canada, by Dr. Frederick Montizambert; on behalf of the Republic of Mexico, by Prof. Carlos Orvananos; and on behalf of the Republic of Cuba, by Dr. Federico Torralbas.

The President of the Association then delivered his annual address. See p. 572, Vol. VI.

On motion, the meeting then adjourned until Wednesday, October 20th, at half past two o'clock, p. m.

WEDNESDAY, OCTOBER 20th, 1909.

Second Day. Afternoon Session.

The Association was called to order at half past two o'clock, p. m., by the President.

The Report of the Committee of Seven,* approved by the Executive Committee, was then submitted by the Secretary, as follows:

REPORT OF COMMITTEE OF SEVEN.

The following official acts have been performed by the Committee of Seven during the year.

* No action appears to have been taken on this report.

At the last meeting the Committee on Mailing of Infectious Material presented a report recommending certain changes in the postal regulations governing this matter. Through an oversight no action was taken by the Association in authorizing the further steps which would be necessary to secure results from such recommendations. On December 18th, 1908, the question of authorizing Dr. Anderson, as chairman of the Committee to take such further steps as he deemed advisable was submitted to the Committee of Seven and approved. Dr. Anderson was notified of the action of the Committee.

At the Winnipeg meeting a resolution was presented, which, owing to lack of time was not referred to the Association after having received the approval of the Executive Committee. This resolution was as follows:

By Dr. Evans: "Resolved, that it is the sense of the American Public Health Association that in cities of 300,000 and over, the next census should be taken on the basis of city blocks."

The following motion by Dr. Hill also failed to receive final action.

"I wish, however, to move the appointment of a committee to consider the question of typhoid fever in every respect, but particularly to agitate in every manner the reporting of cases of typhoid fever, and directing their efforts to the municipality, the health officers, and the individual physician."

The motion by Dr. Hill was referred to the Committee of Seven and the action of the Committee was to instruct the President to appoint a committee to consider the question of typhoid fever in every respect.

The resolution by Dr. Evans in regard to the collection of the census was approved and a copy of the resolution was sent to the Director of the Census.

By action of the Committee, the President was instructed to appoint a committee on Anti-Vaccination, such a committee having been provided for by an act of the Association at the Winnipeg meeting.

Pursuant to the provision of the constitution, the committee approved of expenses during the past year as follows:

Postage for Secretary	$25.00
Payment of Treasurer's bond	15.00
Printing, including list of members, sanitary authorities, constitutions, and by-laws of the Association, and various sections, stationery, etc.	200.00
Binding, Part 2, Vol. 33	135.00
Distribution of Part 2, Vol. 33	80.00
Postage for Treasurer	30.00
	$485.00

In May the question of fixing the date for this meeting was taken under consideration. After correspondence with the local Committee of Arrangements, it was decided to hold the meeting on October 19th–22nd, inclusive.

Respectfully submitted,

C. O. PROBST, Secretary.

Dr. W. A. Evans offered the following resolution:

"Resolved, That the American Public Health Association be requested to appoint a conference committee of five members, to meet with the conference committee of the American Medical Association and with the conference committee of the Conference of State and Provincial Boards of Health (provided the latter body appoint such a committee), with the view of considering the matter of co-operative work in public health, with instructions to report at the next meeting of the American Public Health Association."

This resolution was referred to the Executive Committee.

Dr. Knopf moved that the committee proposed, if appointed, be appointed by the President in conference with the Executive Committee. Seconded by Dr. Montizambert. Carried.

The Executive Committee, through the President, reported that it had considered the amendment to the by-laws, offered by Dr. J. F. Anderson, at the Winnipeg meeting, to extend the time for reading papers from fifteen minutes to 20 minutes, and recommended that the amendment be not adopted. On motion of Dr. Cole, the committee's report was adopted.

Dr. Woodward moved that the Association authorize the President to send to Dr. Wm. Bailey, of Louisville, Ky., a telegram of appreciation and regret, Dr. Bailey having been unavoidedly detained at home on account of ill health. Carried.

Dr. Montizambert moved that a like telegram be sent to Dr. Eduardo Liceaga, of Mexico City, Mexico. Carried.

The following symposium on The Place of Public Hygiene in Modern Sociology was presented and the several papers discussed:

The Scope of Public Hygiene in the Betterment of the Home Life in Towns and Cities, by Mr. Robert W. Bruere, General Agent of the New York Association for Improving the Condition of the Poor, New York City.*

The Scope of Public Health Work in the Prevention of Dependency, by Mr. Homer Folks, Secretary of the State Charities Aid Association, New York City; read by Mr. John A. Kingsbury. See p. 732, Vol. V.

The following papers were then read and discussed, comprising a Symposium on Industrial Hygiene:

Age Problems in Industrial Hygiene, by Mr. Owen R. Lovejoy, Secretary of the National Child Labor Committee. See p. 233, Vol. VI.

The Sex Problem in Industrial Hygiene, by Mrs. Florence Kelley, Secretary of the National Consumers' League. See p. 252, Vol. VI.

Dr. Lee Frankel, of New York City, then read a paper on Relations of Life Insurance to Public Hygiene. See p. 258, Vol. VI.

The following papers were then read:

The Physiological Aspects of Ventilation, by Prof. Theodore Hough, University of Virginia. See p. 262, Vol. VI.

The Sanitary Requirements of Ventilation, by Dr. W. A. Evans. See p. 570. Vol. VI.

The Ventilation of Industrial Establishments, by Dr. C. T. Graham Rogers, of New York City. See p. 245, Vol. VI.

Instructive Inspection, by Mrs. E. H. Richards. See p. 493, Vol. VI.

Co-operative Efforts in Supervision and Control of Milk Supplies, by Mr. F. D. Bell. See p. 539, Vol. VI.

Mrs. Caroline Bartlett Crane, of Kalamazoo, Michigan, then addressed the Association on "What Is Happening to American Meat Inspection."*

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*Not received for publication.

NOTE.—Through a misunderstanding on the part of the stenographer, Mrs. Crane's remarks were not reported, and they have never been submitted for publication.

Prof. Winslow moved that a Committee of Five be appointed by the Chair to consider the charges made in Mrs. Crane's remarks. Seconded.

Dr. Woodward moved that Prof. Winslow's resolution be referred to the Executive Committee. Carried.

On motion, the Association then adjourned to meet at quarter past eight o'clock, p. m., Wednesday.

WEDNESDAY, OCTOBER 20, 1909.

Second Day. Evening Session.

The meeting was called to order at quarter past eight o'clock p. m., by the President. The following papers were then read and discussed:

Dust Problems in the Industries, by Dr. William C. Hanson. See p. 239, Vol. VI.

Relation of Typhoid Fever to the Water Supplies of Illinois, by Prof. Edward Bartow. See p. 43, Vol. VI.

The meeting then adjourned until Thursday, October 21st, at eight o'clock, p. m.

After adojurnment, a smoker was held.

THURSDAY, OCTOBER 21st, 1909.

The day was given up to a boat ride on the James River. No morning or afternoon session was held.

Third Day. Evening Session.

The Association was called to order at eight o'clock, p. m., by Dr. R. M. Simpson, First Vice President.

The Executive Committee, to which was referred the resolution offered by Prof. Winslow, for the appointment of a committee to consider the subject matter of Mrs. Crane's remarks, submitted the following report:

"The Executive Committee, having been directed by the Association to consider the advisability of appointing a Committee to investigate certain charges made in an address before the Association (which alone they can consider) against the meat inspection under direction of the United States Department of Agriculture, begs leave to report that inasmuch as the speaker by whom that address was delivered appeared before the Com-

mittee and submitted certain documents, and inasmuch as neither these documents nor her statements, in the judgment of the Committee, substantiates those charges, the Executive Committee recommends that no such committee as was proposed in Prof. Winslow's resolution be appointed, and that the motion calling for the appointment of such a committee be laid on the table."

On motion of Dr. Montizambert, seconded by Dr. Cole, the report of the Executive Committee was adopted.

Mr. H. O. Jenkins then delivered an address on Sanitary Education in California by means of a Traveling Railroad exhibit. See p. 503, Vol. VI.

Mr. John A. Kingsbury, Assistant Secretary, State Charities Aid Association, New York, presented a paper entitled, Scope and Value of the Daily Press and Press Bureaus. See p. 506, Vol. VI.

A discussion of these papers then followed.

Dr. H. W. Hill offered the following resolution which was seconded and carried:

"Resolved, That the American Public Health Association appoint a Publicity Committee to convey to the public press at regular short intervals suitably prepared abstracts from its publications.

Dr. Kinyoun offered the following resolution:

"Resolved, That the American Public Health Association recommend the passage of Senate Bill No. 1968, providing for an increase of pay for officers of the Public Health and Marine Hospital Service."

This resolution was referred to the Executive Committee.

Papers were then read as follows:

Teaching Hygiene in Elementary Schools, by Isabel F. Hyams, of Dorchester, Massachusetts. Read by Miss Swarts. See p. 464, Vol. VI.

School Instruction in Hygiene and Sanitation, by Prof. John W. Ritchie, Williamsburg, Virginia. See p. 470, Vol. VI.

The Way to Study Hygiene in the Normal Schools, by Dr. Adrian de Garay. See p. 477, Vol. VI.

Instruction in Personal and Public Hygiene in the Medical College, by Prof. F. F. Wesbrook.*

* This paper was not received for publication.

Organization of the School Hygiene Service, by Dr. Alfonso Pruneda. See p. 482, Vol. VI.

After a discussion of these papers, on motion, the Association adjourned to meet at 9:30 o'clock a. m., on Friday morning, October 22nd.

FRIDAY, OCTOBER 22ND, 1909.

FOURTH DAY. MORNING SESSION.

The Association was called to order at half past nine o'clock a. m., by the President.

The Treasurer then submitted his annual report, duly approved by the Committee of Seven, showing a balance on hand in the General Fund of $979.24, and $2,000 in the Lomb trust fund, as follows:

FRANK W. WRIGHT, TREASURER, IN ACCOUNT WITH THE AMERICAN PUBLIC HEALTH ASSOCIATION.

1908.	DR.	
Aug. 26, Cash on hand		$ 616.54
Cash from Dues for 1906		5.00
Cash from dues for 1907		90.00
Cash from Dues for 1908		2,229.75
Cash from Dues for 1909		125.00
Sales of Transactions		147.05
		$3,213.34
Estate of Henry Lomb		1,910.00
		$5,123.34

1908	CR.	Order No.	
Sept.	14, F. J. Heer Printing Co	280	$ 49.25
	14, C. C. C. & St. L. Ry. Co	281	2.54
	14, Amer. Jour. Pub. Hygiene	282	100.00
	14, C. O. Probst	284	131.45
Oct.	14, H. W. Hill	286	44.50
	14, H. W. Hill	287	9.48
	14, E. B. Phelps	288	2.16
	14, W. L. Beebe	289	6.00
	14, B. R. Rickards	290	11.64
	14, Griffith-Stillings Press	291	16.50
	14, F. J. Heer Printing Co	293	9.00
	14, F. W. Wright	294	144.00
	19, Nora C. O'Donoghue	285	27.48
Nov.	2, Wm. Whitford	295	181.55

1909.			
Jan. 6, Nat. Savings Bank			90.00
13, J. B. Lyon & Co.	296		20.00
Feb. 18, F. J. Heer Printing Co	297		92.75
18, Adams Express Co.	298		1.12
18, B. R. Rickards.	299		250.00
29, Judsen and Hauf	300		15.00
29, F. E. McElroy.	303		13.50
29, F. W. Wright	305		30.00
29, C. O. Probst	306		25.00
Apr. 13, Griffith-Stillings Press.	301		6.63
26, Amer. Statistical Association.	304		127.45
May 18, F. J. Heer Printing Co	307		145.55
18, Amer. Med. Association	308		17.00
18, U. S. Express Co	309		15.20
18, Adams Express Co.	310		20.84
18, American Express Co	311		12.18
18, Wells-Fargo Express Co.	312		17.58
27, B. R. Rickards.	313		500.00
June 30, J. M. Kilduff.	314		8.75
Total Expenditures			$2,144.10
Cash in General Fund			979.24
Cash in Savings Banks			2,000.00
			$5,123.34

We have examined the accounts and vouchers shown in the Treasurer's Report and find the same correct.

WM. C. WOODWARD, Chairman.
October 18, 1909. C. O. PROBST, Secretary.

On motion, the report of the Treasurer was adopted.

The Executive Committee, through the Secretary, then presented the following resolution, and recommended its adoption:

"Resolved, That the American Public Health Association earnestly protest against, as contrary to sound public policy, the practice which now prevails in some places of appointing officers and employes in public health service upon the basis of supposed political expediency, and recommends that all appointments in the federal, state, provincial, and municipal public health service be made solely upon the basis of professional fitness, and that persons so appointed be by law secured tenure of office so long as good behavior and professional fitness continue."

On motion, the resolution was adopted.

The Executive Committee then submitted the following resolution, and recommended its adoption:

"Resolved, That a committee of five be appointed to encourage and solicit a larger membership in the Association from among the sanitary engineers represented, and to consider the relation of the engineer members to the Association."

On motion, the resolution was adopted.

A report was received from the Executive Committee, recommending the adoption of the following resolution, offered by Dr. Kinyoun:

"Resolved, That the American Public Health Association recommends the passage of Senate Bill, 1968, providing for an increase of pay of officers of the Public Health and Marine Hospital Service."

On motion, the report of the Executive Committee was adopted.

The Executive Committee recommended for adoption the following resolution offered by Dr. H. W. Hill:

"Resolved, That the American Public Health Association appoint a Publicity Committee to convey to the public press at regular short intervals suitably prepared abstracts from their publications."

On motion, this resolution was adopted.

The Executive Committee then reported, with a recommendation that it be adopted, the following resolution:

"Resolved, That the Executive Committee recommend to the Association that the health officers of those municipalities which are officially connected with the Association be requested, so far as practicable, to print upon their letter heads a brief statement to the effect that they are members of the American Public Health Association."

On motion, the report of the Executive Committee was rejected.

The Executive Committee then reported favorably the following resolution:

"Resolved, That the Committee of Seven be authorized to arrange, if feasible, for the maintenance by the Association, at the Fifteenth International Congress of Hygiene and Demography

in Washington, of headquarters and an exhibit, and for participation in the meeting, official recognition, and such other matters as the Committee deems proper."

On motion, the report of the Executive Committee was adopted."

The Secretary then submitted to the Association, the following resolution, which had been submitted to the Executive Committee, by Dr. Dixon:

"Whereas, in order to enlist the help both of individuals and of corporate bodies in carrying out sanitary measures, it is advisable to have laws and rules and regulations so framed as not only to be efficient but also as to impose as light a burden as possible upon our people, and

"Whereas, at present the laws and rules and regulations of the various states of the Union designed particularly to restrict the spread of tuberculosis require different forms of notices for this object, some going so far as to order a copy of the organic law regulating spitting to be printed and displayed in each railroad coach, and

"Whereas, railway coaches frequently traversing a number of states having different laws, this makes dust catchers and unnecessarily disfigures the coaches,

"It is recommended, that the several states adopt a terse notice which will satisfy the laws of all the states and that those states which have laws requiring the display of the entire law amend such laws so as to permit the adoption of a uniform notice forbidding spitting, and

"Whereas, the State and Provincial Boards of Health are interested with us in all health measures,

"Be it resolved, that these resolutions be drafted and entrusted to a committee to present to the next Annual Conference of State and Provincial Boards of Health with the request that it adopt the same and communicate its action to the respective Boards and Departments of Health of each state in the Union." (Adopted.)

The report of the Advisory Council was then, in the absence of the Chairman, Prof. Robinson, read by Dr. Woodward, as follows:

REPORT OF THE ADVISORY COUNCIL.

At a meeting of the Advisory Council, held October 21st, pursuant to the constitution and by-laws of the Association, more than twenty members being present, the undersigned was elected chairman and William C. Woodward, secretary.

The following members of the Association were thereupon duly selected for nomination, and they are hereby nominated, for the offices prefixed to their respective names, during the terms prescribed by the constitution and by-laws:

For President, Dr. C. O. Probst.

For First Vice-President, Dr. Charles A. Hodgetts.

For Second Vice-President, Dr. E. C. Levy.

For Third Vice-President, Dr. Federico Torralbas.

For Secretary, Dr. Wm. C. Woodward.

For Treasurer, Dr. Frank W. Wright.

For Executive Committee, Dr. Eugene Buehler, Dr. Marshall L. Price, Dr. Cressy L. Wilbur.

The Advisory Council after due consideration of invitations received from Milwaukee, Wis.; Niagara Falls, N. Y.; Washington, D. C.; Rochester, N. Y.; Havana, Cuba; Toledo, Ohio; St. Louis, Mo.; Austin, Texas; and Houston, Texas; recommends that the next annual meeting of the Association be held in Milwaukee, Wisconsin.

Respectfully submitted,

FRANKLIN C. ROBINSON, Chairman.

On motion of Dr. Bryce, the report of the Advisory Council was adopted.

Dr. Evans moved that the President, Dr. Swarts, be instructed to cast the ballot of the Association for Dr. C. O. Prosbt, as President for the ensuing year. Carried. The President of the Association thereupon cast the ballot for Dr. C. O. Probst, as directed, and Dr. Probst was declared elected.

On motion of Dr. Kinyoun, the Secretary was instructed to cast the ballot of the Association for the election of Dr. Wm. C. Woodward, as Secretary, and for the three members of the Executive Committee, as recommended by the Advisory

Council. The Secretary thereupon cast the ballot as above directed, and Dr. W. C. Woodward was declared elected Secretary, and Dr. Eugene Buehler, Dr. Marshall L. Price, and Dr. Cressy L. Wilbur elected as members of the Executive Committee.

On motion of Dr. Evans, the Secretary was instructed to cast the ballot for Dr. Charles A. Hodgetts, Ernest C. Levy, and Federico Torralbas as first, second, and third vice-presidents, respectively, as recommended by the Advisory Council. The Secretary thereupon cast the ballot as directed, and the members above named were declared duly elected to the offices respectively, as above.

Dr. Hurty, moved that the recommendation of the Advisory Council that the next meeting of the Association be held in Milwaukee, be adopted. Carried.

Dr. Hodgetts gave notice of the following amendment to the by-laws: Amend Chapter 7, so as to provide that the annual fee of five dollars shall entitle to membership in the Association, and to membership in one section only, the member designating at the time of application, and annually thereafter, at the time of the payment of the annual fee, the particular section with which he desires to become identified, and that an additional fee of $2.00 be charged for each additional section in which membership is desired.

Dr. H. D. Holton submitted the report of the Committee on Necrology. See p. 593, Vol. VI.

On motion, the report of the Committee was adopted.

It was moved, that in memory of the late Henry Lomb, the Association show its respect by rising. The motion was seconded and carried. The Association accordingly rose in memory of Mr. Lomb.

The Secretary then gave notice of the following proposed amendment to the by-laws:

"That the duration of the annual convention shall not exceed six days, and upon five of those only shall be held meetings for the presentation of papers."

Dr. H. W. Hill moved that the Committee on Journal be continued. Carried.

The Committee on the relief of the family of the late Dr. James Carroll, through Dr. Woodward, chairman, reported that the

amount desired by the General Committee, having in hand the relief of the family of Dr. Carroll, had been raised by that Committee and the various agencies enlisted in that behalf.

On motion, the report was adopted, and the committee discharged.

Dr. John F. Anderson, Chairman, reported for the Committee on the Mailing of Infectious Material, that the chief of the Railway Mail Service, under whose jurisdiction this matter lies, seemed to be in sympathy with the proposed modifications with only slight changes from those recommended by the Association last year, and that at the time when the Committee's report was prepared the unsigned regulations were lying upon the Postmaster-General's desk for his consideration and action.

On motion, the report of the Committee was adopted and the Committee continued.

Papers were then read as follows:

An Investigation of the Extent of the Bacterial Pollution of the Atmosphere by Mouth Spray, by Prof. C.-E. A. Winslow, and Mr. E. A. Robinson. See p. 566, Vol. VI.

Results of the Federal Control of Viruses, Serums, Toxins and Analogous Products, by Dr. John F. Anderson. See p. 722, Vol. V.

How an Enlarged and Uniform National Health Administration May Be Secured, by Dr. Joseph Y. Porter. See p. 545, Vol. VI.

Tuberculosis from a Maritime Prophylactic Point of View, by Dr. Antonio Matienzo. See p. 547, Vol. VI.

What May Be Done to Improve the Hygiene of the City Dweller, by Dr. S. A. Knopf. See p. 612, Vol. VI.

Prophylaxis in Exanthematic Typhus, by Dr. Genaro Escalona. See p. 553, Vol. VI.

The report of the Laboratory Section was then submitted by Dr. Wm. Royal Stokes, who ahnounced the election of the following section officers: Dr. Wm. R. Stokes, Baltimore, Chairman; Dr. John A. Amyot, Toronto, Vice-Chairman; Mr. B. R. Rickards, Columbus, O., Secretary; Dr. H. D. Pease, New York, Recorder.

The report of the Section on Vital Statistics was read by Dr. Marshall L. Price, who announced the election of the following section officers: Dr. W. H. Guilfoy, New York City, Chairman;

Dr. W. C. Woodward, Washington, Vice-Chairman; Dr. W. R. Batt, Harrisburg, Secretary.

The report of the Municipal Health Officers' Section was presented by Dr. A. J. Douglas, who announced the election of the following section officers: Dr. S. H. Durgin, Boston, Chairman; Dr. Eugene Buehler, Indianapolis, Vice-Chairman; Dr. E. C. Levy, Richmond, Va., Secretary; Dr. C. Y. Chapin, Providence, Recorder. (See p. 736, et seq. for list of papers on the programs of these sections.)

The Executive Committee recommended the adoption of the following resolution: "Resolved, that a committee of five be appointed by the incoming president, which shall consider practical methods of education of the people concerning the communicability of gonorrhoea and syphilis." On motion, the report of the committee was adopted.

The Secretary then reported that the question of printing the transactions had been considered by the Executive Committee, and that it had been referred by that Committee to the Committee of Seven, with instructions to make the best arrangements possible.

The Secretary then reported that the Executive Committee had re-appointed Prof. F. C. Robinson and Dr. J. N. Hurty, as members of the Committee of Seven and had appointed Mr. James O. Jordan and Dr. Charles A. Hodgetts to take the places of Dr. Henry Mitchell and Dr. Richard H. Lewis, whose terms of office had expired.

After some discussion concerning the feasibility of establishing a trust fund for the carrying out of the purposes of the Association, the Secretary and Treasurer of the Association were instructed, by unanimous consent, to secure an act of incorporation for the Association.

The Executive Committee, through the Secretary, recommended the adoption of the following resolution, offered by Dr. Evans:

Resolved, that a committee of five be appointed to represent the Association in Conference with the national societies and associations organized for the consideration of subjects directly or indirectly relating to public health work, and to report information and plans for co-operative efforts."

On motion, the report of the Committee was adopted.

The President then announced that, after conference with the Executive Committee, he had appointed as the committee of five to co-operate with the national and other organizations engaged in public health work, and to confer with a committee appointed by the American Medical Association for that purpose, Drs. Holton, Swarts, Pease, Batt, and Woodward.

The Executive Committee recommended the adoption of the following amendment to the constitution, so as to facilitate the creation of a trust fund.

In Article V, insert after Section 7, a new section, to be designated as Section 7a, as follows:

"That there be a committee on trust funds appointed by the President, to consist of three members, to establish, augment, and to see to the disbursement of, trust funds for the purposes of the association, and in accordance with the will of the donor."

A resolution of thanks to the people of the State of Virginia, to the people of the city of Richmond, and particularly to the local committee on arrangements, and to the local press, was then offered by Dr. Hurty. By a rising vote, the resolution was adopted.

The Mexican Delegation, through Mr. Lacalle, expressed the thanks of the delegation for the courtesies received at the convention.

The President thanked the Association for the honors conferred upon him and for the assistance he had received from the members of the different committees, and introduced the newly elected president, Dr. Probst, who thereupon made a brief speech.

On motion, the 37th annual meeting of the American Public Health Association was declared adjourned.

C. O. PROBST, Secretary.

TITLES OF PAPERS APPEARING ON SECTION PROGRAMS.

LABORATORY SECTION.

Bacteriological Methods for Air Analysis, John Weinzirl.

Preliminary Note on the Determination of Carbon-Dioxide in Air by Electrical Conductivity, E. C. Howe.

Report of Committee on Technical Progress.

Report of the Committee on Standard Methods for the Examination of Air, C-E. A. Winslow, Chairman.

Longevity of *B. diphtheriae* on Swabs, F. H. Slack, B. L. Arms, and E. Marion Wade.

Report of the Committee on Standard Methods for the Bacterial Diagnosis of *B. diphtheriae*, B. R. Rickards, Chairman.

Period of Incubation of Inoculation Rabies, B. L. Arms, Jr.

Report of Committee on Standard Methods for the Diagnosis of Rabies, Anna Williams, Chairman.

Report of Committee on Standard Methods for the Bacterial Diagnosis of Glanders, Ward L. Beebe, Chairman.

Preliminary Report of the Committee on Standard Methods for the Bacterial Diagnosis of Syphilis, H. U. Williams, Chairman.

The Laboratory in Its Relation to Tropical Medicine, J. J. Kinyoun.

A Bio-chemical Reaction for Detecting Pollution in Water-Supplies, Edward Bartow and Andrew Watson Sellards.

An Analytical and Epidemiological Study of Farm Water Supplies, Karl F. Kellerman and H. A. Whittaker.

The Control of Algal Pollution in the Reservoirs of the Canal Zone, Karl F. Kellerman and James O. Meadows.

Liver Broth; A Medium for the Determination of Gas-forming Bacteria in Water and Sewage, D. D. Jackson and T. C. Muer.

Pancreatin-bile Salt Medium for the Detection of *B. coli* in Water, Luther R. Sawin.

The Comparative Value of Lactose-peptone Bile and Lactose-peptone Neutral-red Solutions in Water Examinations. William H. Park and Josephine S. Pratt.

Studies on Inhibition, Attenuation and Rejuvenation of *B. coli*, Frank E. Hale and Thomas W. Melia.

Bacteriological Examinations of Shell-fish and the Interpretation of Results, H. D. Pease.

The Necessity for a Standard of Allowable Pollution for Oyster Inspection, A. W. Freeman.

A Comparative Study of Fecal Streptococci from the Horse, Cow, and Man, C-E. A. Winslow and G. T. Palmer.

Bacterial Flora in Milk Held at Low Temperatures, Mazyck P. Ravenel, E. G. Hastings and B. W. Hammer.

The Determination of the Number of Leucocytes in Milk by a Direct Method, Samuel C. Prescott and Robert S. Breed.

Artificial Milk as a Culture Medium, H. W. Hill.

Report of the Committee on Standard Methods of Chemical Milk Analysis, James O. Jordan, Chairman.

Report of the Committee on Standard Methods of Bacterial Milk Analysis, Francis H. Slack, Chairman.

Contribution to the Microscopical Investigation of *Haematozoon Malariae*, O. Gonzalez-Fabela.

The Possibility of Tetanus Toxin Being Found in Diphtheria Antitoxin Concentrated and Refined after the Gibson Method, S. H. Gilliland.

The Influence of Age and Temperature on the Potency of Diphtheria Antitoxin, John F. Anderson.

Report of Committee on Standard Methods of Preparing Small-pox Vaccine, J. H. Huddleston, Chairman.

Disposal of Creamery Wastes, James T. B. Bowles.

Report of Committee on Standard Methods of Chemical Analysis of Water and Sewage, Earle B. Phelps, Chairman.

The Bacteremia Theory of Tuberculosis (a Preliminary Report), Joseph McFarland and E. Burville Holmes.

Report of the Committee on Standard Methods for the Bacteriological Diagnosis of Tuberculosis, Mazyck P. Ravenel, Chairman.

An Incubator Heated and Controlled by Electricity, Edward Bartow and Frank Bachmann.

A Bacteriological Thermostat, Constant Temperature Maintained by a Boiling Liquid, E. C. Howe.

Standard Fumigating Outfit Supplied to People in Rural Districts at Cost, A. W. Freeman.

Standard Methods for Testing Disinfectants, William Dreyfus.

A Modification of Hesse's Medium for the Differentiation of Typhoid Colonies in Water and Stools,
William Royal Stokes and Frank W. Hachtel.

A New Mailing Outfit for Sending Bile Specimens of Blood, Feces and Urine and the Results of Such Cultures Made for Physicians, William Royal Stokes and Harry W. Stoner.

Note on an Organism Isolated from Washington Tap Water and Agglutinating Readily by the Serum of Typhoid Fever Patients, W. H. Frost.

Report of the Committee on Standard Methods for the Preparation of Tuberculin and Mallein, Veranus A. Moore, Chairman.

JOINT MEETING OF THE MUNICIPAL HEALTH OFFICERS' SECTION AND THE LABORATORY SECTION.

The Need of Quantitative Methods in Epidemiological Work,
Charles V. Chapin.

A Legal Decision, Gerhard A. Bading.

A Water-borne Outbreak of Typhoid Fever, Marshall L. Price.

Utilization of Bacteriological and Microscopical Methods in the Inspection of Milk, J. O. Jordan.

SECTION ON VITAL STATISTICS.

Morbidity Statistics in the Matter of Insanity in Immigrants,
Peter H. Bryce.

The Ages of 500 Cases of Hookworm Disease and Frequency of the Disease in the Different Age Groups, C. W. Stiles.

Small Pox in the United States, J. W. Trask.

A Revised Standard Certificate of Death for Use Beginning January 1, 1910, Cressy L. Wilbur.

The Characteristics of Naval Vital Statistics, Frank L. Pleadwell.

American Birth Statistics, Franklin C. Gram.

The Importance of Population Vital Statistics Actuarilly Considered, Miles M. Dawson.

The International Congress on Hygiene and Demography,
Walter F. Wilcox.

Symposium on Registration of Vital Statistics in the South,
Ennion G. Williams, W. M. Brumby,
C. F. Williams, Cressy L. Wilbur.

Joint Session of the Section on Vital Statistics with the Section of Municipal Health Officers.

Vitalization of Municipal Vital Statistics, E. C. Levy.
The Police Health Census of Baltimore, C. H. Jones.
Mortality and Morbidity Returns by Streets, Wards, and Other Minor Municipal Divisions (illustrated by Maps), W. H. Guilfoy.
The Relation of Public Water Supplies to General and Specific Mortalities in Cities, A. Lederer.

SECTION OF MUNICIPAL HEALTH OFFICERS.

The Tuberculin Test as Applied to a City's Milk Supply, G. W. Goler.
The Municipal Control of a Milk Supply, W. A. Evans.
The Clean Milk Campaign in Hamilton, Ontario. J. A. Roberts.
Report of Committee on City Wastes, P. M. Hall, Chairman.
Waste Disposal Conditions in Edmonton, T. H. Whitelaw.
The Limitations of the Septic Tank, Charles A. Hodgetts.
Medical Inspection of Schools, S. H. Durgin.
The School Nurse as an Aid to Medical School Inspection, Guy L. Kiefer.
The Organization of the Health Department of Vera Cruz, M. S. Iglesias.
The Health Officer and Civic Organizations, J. F. Edwards.
What May Be Done to Improve the Hygiene of the City Dweller, S. A. Knopf.
The Prevention of the Spread of Contagious Diseases, A. S. Fell.
An Account of an Outbreak of Typhoid Fever Due to a Double Water Supply. A. J. Douglas.
Methods of Control of Infectious Disease by Boards of Health, Especially in Small Communities, F. G. Curtis.
Diphtheria. Round Table Discussion, W. A. Evans, Chairman.

The Massachusetts Association of Boards of Health

JULY QUARTERLY MEETING

Boston, Massachusetts

The quarterly meeting of the Massachusetts Association of Boards of Health was held at Gallup's Island, Boston Harbor, Wednesday July 20, 1910. President Walcott presided.

The following new members were elected on the recommendation of the Executive Committee:

Dr. L. E. Hill, of the Millis Board of Health;

Dr. Walter G. Chase, of Boston;

Dr. F. X. Mahoney, of the Boston Board of Health;

Curtis Morrison Hilliard, Dublin Chemical and Bacteriological Laboratory, Dublin, N. H.

Dr. William J. Sullivan, of the Lawrence Board of Health;

William A. Meagan, of the Lawrence Board of Health.

Dr. M. Marie Knudson, Women's Educational and Industrial Union, Sanitary Inspector.

Dr. William J. Hatchett, of Somerville;

Henry Copley Greene, of the Massachusetts Commission for the Blind, Boston;

George C. Frolich, Ph. G., Phar. D., of the Lynnfield Centre Board of Health.

Dr. F. H. Dunbar, of Boston;

Dr. C. H. Jennings, of Fitchburg;

D. N. C. Hyams, of Canton;

Dr. E. W. Burt, of Westport, Mass.;

Dr. Erik S. J. Johnson, of New Bedford;

Harold Winslow, of New Bedford.

REPORT OF THE COMMITTEE ON MILK LEGISLATION.

The Committee on Milk Legislation appointed two years ago rendered a report accepted as progressive at the October, 1908, meeting, and under instruction of this Association introduced a bill at the 1909 Legislature transferring milk inspection to the local boards of health. At the July, 1909, meeting the Committee reported it had been successful in securing the legislation sought for. This was regarded as satisfactory by the Committee in all but one particular—an amendment providing that in towns the compensation of milk inspectors should be determined by the selectmen. Accordingly a bill was introduced at the 1910 Legislature eliminating the undesirable section, and at the present meeting the Committee desires to report a successful passage of this bill, thus placing cities and towns upon an equal basis.

At the July, 1909, meeting the committee by vote of the Association was instructed to draw up a milk regulation as a guide for such regulations for the boards of health of the state.

At the January, 1910, meeting the Committee reported a draft of such regulation, which by vote of the Association was ordered printed and sent to the local boards of health of the state. This was done, and the Committee believes it has already either been adopted entirely or has served as a basis for a number of local boards of health in framing their milk regulation.

The Committee, believing that an examination to ascertain the bacterial content of milk furnishes the most certain evidence of its condition as regards age and cleanliness, would urge the incorporation of a rule as part of all milk regulations limiting the number of bacteria permissible in milk intended for sale.

Geo. E. Bolling, Chairman.

(The report was accepted and referred to the Committee on Publication. It was also voted to continue the committee with the addition of two members appointed by the President.)

THE IMPORTANCE OF CONTACT INFECTION

By CHARLES V. CHAPIN,
Health Officer, Providence, R. I.

It is not easy to formulate an accurate definition of contact infection, but it will suffice for our present purpose to assume that this term carries the idea of a quite direct transfer of quite fresh infective material. The contact may not be direct, in fact it frequently is not, but when mediate, it is nevertheless usually pretty close in time and space. Infection by contact is the most obvious mode of transmission of the contagious diseases, yet it has until quite recently been to a large extent disregarded. The reason for this is that a large portion of cases of these diseases apparently have no connection with other cases. Hence our forefathers were obliged, on *a priori* grounds, to develop theories of infection by fomites and infection by air, in order to explain the hidden connection which they believed must exist between cases separate in time and space. But owing to more careful observation, and chiefly to our rapidly increasing knowledge of the disease-producing bacteria and protozoa, we now know that the unrecognized sources of infection, the mild neglected cases and the true carriers, are extremely numerous. They have indeed been shown to be so numerous that the opportunities for contact with them are sufficient to give rise to all cases of contagious disease not otherwise explained, and to render unnecessary, theories of long persistent fomites infection and long distance aerial infection, theories which more careful observation has shown to have little basis in fact.

The experience of the Babies Hospital in New York in dealing with gonorrheal infection is most instructive, as it shows how contact infection was finally proved to be the cause of a most presistent infection which lasted for many years, and which for a long time appeared most mysterious and impossible of control. Gonorrheal vaginitis and ophthalmia appeared frequently in the hospital, though the greatest care was taken in the admission of patients, and continued to spread, although very great precau-

tions were taken by providing separate nurses, washing the napkins separately, and boiling and disinfecting them, and disinfecting the wards and their contents. Later, napkins were discarded and pads were used, which could be burned, all cloths used about the patients were burned, separate thermometers and other utensils were provided, and all tub baths forbidden. Still case after case would recur in the same ward, and sometimes cases in distant parts of the hospital. Such persistent and erratic infection in scarlet fever or diphtheria would be considered ample confirmation of current views concerning fomites and air infection, and indeed infection of the house was considered a possibility by the medical men in charge of the Babies Hospital. But it was finally determined that the infection, which found its way in through mild unrecognized cases which escaped the vigilance of the admitting physician, was carried from child to child by the nurses, who were also responsible for the cases in distant wards. As soon as the nurses were taught to wear gloves and to wash and disinfect them after handling each case, and were made to realize the necessity for a strict asepsis, the extension of the disease ceased. Thus clinical experience demonstrated that this disease is spread solely by contact, a conclusion which might theoretically be deduced from our knowledge of the gonococcus which has such an exceedingly low resistence as to preclude the possibility of fomites or aerial infection.

Of late years a great deal has been said about the spread of typhoid fever by contact infection. The report on this disease during the Spanish War emphasized the fact that over 60 percent of the attacks were connectible, and though the commission considered the fly as a factor of great importance, they evidently believed that infection by contact was the chief source of the disease. In Europe attention was drawn most forcibly to this mode of infection by the investigations of Koch in certain rural outbreaks in Germany. He definitely stated that water, food and soil infection could be excluded, and that the disease in the villages which he visited was spread almost exclusively by contact. While Koch, and the report of Reed, Vaughan and Shakespeare have had great influence in popularizing the idea of contact infection, it is well to remember that Sedgwick in a report to the Massachusetts State Board of Health on typhoid fever in

certain mill villages in 1892, called attention in an emphatic manner to the importance of contact infection and infection by flies as well. I cannot better illustrate what is meant by contact infection than to quote Prof. Sedgwick's words: "Children abound; and, as there are no fences, and because it is the custom, they mingle freely, playing together and passing from house to house. The families are of that grade in which food always stands upon the table; meals are irregular except for those who must obey the factory bell. The children play awhile, then visit the privies, and with unwashed hands finger the food upon the table. Then they eat awhile and return to play. Or, changing the order of things, they play in the dirt and eat and run to the privy, then eat, play, and eat again, and this in various houses and in various privies. For them, so long as they are friendly, all things are common—dirt, dinners and privies; and, to illustrate exactly how secondary infection may go on, I may describe in detail one case which I personally witnessed. A whole family (of six or more) was in one room. Four of them had the "fever," two of these were children in the prodromal stage. A table stood by the window covered with food, prominent among which was a big piece of cake. It was early September, and a very warm day; but every window was shut and the odor was sickening. Flies innumerable buzzed about, resting now on the sick people, now on the food. A kind-hearted neighbor was tending the baby. By and by one of the children having the fever withdrew to the privy probably suffering with diarrhoea, but soon returning, slouched over to the food, drove away some of the flies, and fingered the cake listlessly, finally breaking off a piece, but not eating it. Stirred by this example, another child slid from his seat in a half-stupid way, moved to the table, and, taking the same cake in both hands, bit off a piece and swallowed it. The first boy had not washed his hands, and if the second boy suffered from secondary infection, I could not wonder at it.

This was one case; but I have seen so often the table of food standing, hours long in the kitchen and serving as one station in the dirty round of lives like these, that it is easy for me to understand how dirt, diarrhoea and dinner too often get sadly confused. Personal filth is apparently the principal agent of

secondary infection. The privies had been in obviously bad condition, and, from some, filthy streams ran down between them and the houses. In and around these streams the children played. Given any original imported case, the infection might easily have reached these trickling streams. Children's fingers might thence carry the germs to the food, and thus the journey of the germs from one living intestine to another be completed. Or, again, given in such a community an imported case and no disinfection, as was the condition here at first. The importer while in the early stages handles with unclean hands food for others or the clothing of such a person gets infected and is handled; there need be then no difficulty in completing the history. It follows as a matter of course." Almost precisely similar conditions were noted by Koch in the Trier villages. But it is not only among careless soldiers in military camps, and the ignorant poor of mill villages that the fingers become carriers of fecal bacteria. Winslow during his studies at the Massachusetts Institute of Technology found colon bacilli on the hands of a considerable proportion of the persons examined, and Hall in Bristol, England, recovered fecal bacteria from the finger nails and hands of fairly cleanly people after the usual procedures following the use of the closet and toilet. The opportunities for fecal contamination are certainly very great. The water closets in public places are often filthy and so are they in all but the better class of houses. If they are clean in our best hotels and residences it is only by dint of constant scrubbing. The careless use of the closet, the splashing of the water, and the application of the toilet paper result in contamination of seat, hands, pull and door, and provide for the free interchange of excremental material from person to person. The conditions in privies are worse still. Yet how many persons make it an invariable rule to wash the hands after use of closet or urinal? What opportunities there are for the waitress, the nurse, the fruit peddler, the baker, and the grocers clerk to infect others. And when it is seen how often the average man goes direct to his food after the use of the closet it will not be considered surprising that some people at least once in their lives implant typhoid bacilli on their own mucous surfaces. It has been foolishly said that for every case of typhoid fever some one ought

to be hung. Is it not a fact that in a large number of cases of typhoid fever the self inoculated disease is an automatic substitute for the suggested judicial punishment?

It is not surprising then that we are coming more and more to see in contact infection an important source of typhoid fever. Nor is it merely a coincidence that this conception has developed hand in hand with the recognition of the prevalence of mild cases, formerly unrecognizable, and true carriers. It is these unrecognized sources which furnish opportunities for contact infection, which opportunities until recent years were not known to exist.

Extensive municipal outbreaks have been reported as largely or entirely due to contact infection. Winslow in 1901 studied such an outbreak in Newport, and suggested the name of "prosodemic" infection. Others have been reported from Knoxville, Winnipeg, Springfield and from Germany and England. Freeman says that the majority of the outbreaks in the smaller towns of Virginia are due to this cause. Sedgwick has graphically described the influence of the privy in promoting contact infection, and a great volume of testimony from the United States, Canada, England, the Continent of Europe and Australia shows that the removal of privies as certainly reduces typhoid fever as does the improvement of water supplies. Extensive institutional outbreaks of typhoid fever due to contact infection are frequently reported, due of course usually to mild cases and carriers. In fact, most of the typhoid fever traced to carriers is due to direct contact. Institutional outbreaks are reported from Connecticut, Massachusetts, New Jersey, Indiana and from asylums in England and Germany. Contact infection in the family too is constantly coming under observation. "Typhoid Mary" was able to infect six families, and the journals and health reports contain frequent references to contact infection in the household. I have recently noted outbreaks in three groups of allied families, in two of which the families were not in the same neighborhood, so that fly infection was impossible. In fact, much of this presumably contact infection occurs in the season when there are no flies. Sometimes too we have contact infection on a battle ship, or a passenger steamer. It seems to me that when water and milk can be excluded infection by

contact is by far the most important source of typhoid fever in our American towns and cities. The term, "The great unwashed," suggests habits conducive to contact infection, so that its frequent occurrence among the public is not surprising, but it does seem remarkable that among hospital nurses who above all others should be clean, contact typhoid as shown by the experience of the London hospitals, is twenty times more prevalent than it is among other women of the same age. If the hospital management, as Edsall observed in Philadelphia, allows nurses to pass from bed pans to food without effectively washing the hands, it is not surprising that both nurses and patients contract the disease. Edsall by insisting upon surgical cleanliness among his medical nurses has stopped this infection, but other hospitals have found it easier to inject vaccines than to teach their nurses to wash their hands.

Although there is not so voluminous a literature relating to contact infection in other fecal-borne diseases, there is no doubt that dysentery and cholera and other diarrheal diseases are frequently spread in this way. Numerous outbreaks of bacillary dysentery in insane asylums, due to contact infection, have been reported in this country and in England, Holland and Germany, and also some outbreaks in civil life. Even amebic dysentery may be caused in this way, as reported by Lemoine in Paris, and Allan in North Carolina. Contact infection in cholera has been reported from India, Germany and recently in Russia, and our officers in the Philippines consider that where water is not infected, this is the most common origin of the disease. While the evidence in regard to diarrhea is not so conclusive, many English health officers as Newsholme, Sandilands and others, consider that contact infection is an important factor in this disease, and evidence is derived from both hospital experience and civil life.

If infection by contact is of such very great importance in the fecal-borne diseases, how much more important must it be in diseases in which the infective agent is found in the secretions of the nose and mouth, as is the case with diphtheria, scarlet fever, smallpox, mumps, measles, whooping cough, tuberculosis, influenza and cerebro-spinal menigitis. Every one avoids feces and urine, but it is only the very few who have any objection to saliva. As I have elsewhere remarked: "Not only is the saliva

made use of for a great variety of purposes, and numberless articles are for one reason or another placed in the mouth, but for no reason whatever, and all unconsciously, the fingers are with great frequency raised to the lips or to the nose. Who can doubt that if the salivary glands secreted indigo the fingers would not continually be stained a deep blue, and who can doubt that if the nasal and oral secretions contain the germs of disease these germs will not be almost as constantly found upon the fingers. All successful commerce is reciprocal, and in this universal trade in human saliva the fingers not only bring foreign secretions to the mouth of their owner, but there exchanging it for his own, distribute the latter to everything that the hand touches. This happens not once, but scores and hundreds of times during the day's round of the individual. The cook spreads his saliva on the muffins and rolls, the waitress infects the glasses and spoons, the moistened fingers of the peddler arrange his fruit, the thumb of the milkman is in his measure, the reader moistens the pages of his book, the conductor his transfer tickets, the "lady" the fingers of her glove. Every one is busily engaged in this distribution of saliva, so that the end of each day finds this secretion freely distributed on the doors, window sills, furniture and playthings in the home, the straps of trolley cars, the rails and counter and desks of shops and public buildings, and indeed upon everything that the hands of man touch. What avails it if the pathogens do die quickly? A fresh supply is furnished each day. Besides the moistening of the fingers with saliva and the use of the common drinking cup, the mouth is put to numberless improper uses which may result in the spread of infection. It is used to hold pins, string, pencils, paper and money. The lips are used to moisten the pencil, to point the thread for the needle, to wet postage stamps and envelopes. Children "swap" apples, cake and lollipops, while men exchange their pipes and women hat pins. Sometimes the mother is seen "cleansing" the face of her child with her saliva-moistened handkerchief, and perhaps the visitor is shortly after invited to kiss the little one.

Children have no instinct of cleanliness, and their faces, hands, toys, clothing, and everything that they touch, must of necessity be continually daubed with the secretions of the nose

and mouth. It is well known that children between the ages of two and eight years are more susceptible to scarlet fever, diphtheria, measles and whooping cough, than at other ages, and it may be that one reason for this is the great opportunity that is afforded by their habits at these ages for the transfer of the secretions. Infants do not of course mingle freely with one another, and older children do not come in such close contact in their play, and they also begin to have a little idea of cleanliness."

It is possible that tuberculosis may be chiefly an air-borne disease, though the evidence for this is far from conclusive. But most observers except the more enthusiastic adherents of the dust and droplet theories, admit that contact infection may play a large part in the causation of this disease. But for the other common diseases, those which health officers and physicians in this part of the world have to do with daily, there is every reason to believe that they are spread chiefly by the quite direct transfer of the fresh fluids of the mouth and nose. It has been amply demonstrated that unrecognized foci of infection, mild cases, and carriers are numerous enough, the infective material is in the secretions, and as we have seen, the opportunities for the transfer of the secretions are numberless. This is certainly the most obvious mode of transfer. We have no right to assume the more circuitous routes of infection by fomites and of infection by air, without good evidence. The burden of proof is upon those who urge these latter theories. But they cannot give good reasons for their position. On the contrary there is much evidence against the importance of air and fomites infection. Careful observations in Providence have shown that in scarlet fever and diphtheria there is practically no danger of the disease passing from one family to another in the same house unless there is actual contact between the families. Many other observers have noted that in the family itself disease is restricted exactly as contact infection is guarded against. The women in the family are three times as likely to contract scarlet fever or diphtheria as the men, because, I believe, they are brought into closer contact with the children. I have recently made a tabulation of families in which diphtheria occurred and where servants or trained nurses were employed. Of 214 servants, who in such cases rarely come in contact with the patient, only

one developed the disease, and in that particular family every individual was attacked and the one servant was obliged to help nurse the sick. The most complete evidence of the great importance of infection by contact, and the small importance of infection by air, is afforded by those hospitals for contagious diseases, which, by rigidly avoiding contact infection, have almost entirely eliminated that cross infection which is the opprobrium of most hospitals, and that too although different diseases are treated in the same open ward.

As health officers it is our duty to strive diligently to educate the public to see the importance of infection by contact. Children must be taught cleanliness. The common drinking cup and the roller towel must go. When contagious disease develops people find it easier to blame the health officer, or the water company, or the house fly, than it is to wash their hands. But they must be shown that the avoidance of disease is largely a personal matter. If each one will put nothing in his mouth which may be daubed with another's saliva the chances of catching disease will be enormously diminished.

We have also a more specific duty. We must teach mothers and nurses and hospital attendants how to avoid carrying infection from one to another. We must adopt the asepsis of the surgeon in homes and hospital wards. Soap and water on the hands is a thousand fold greater bar than a wet sheet before the door. There is no time here to go into details, but the technique necessary to prevent the spread of disease, is neither difficult nor burdensome. If the necessity for, and the efficacy of cleanliness are appreciated the battle is half won.

But it is not yet appreciated. I have elsewhere referred to a number of glaring violations of the principles of cleanliness by those who should know better. When a nurse in a diphtheria ward invariably puts her pencil in her mouth and moistens her finger to turn the bedside charts, when the interne is allowed to empty the bed pan for typhoid cases, and go to his meals without washing his hands, and the superintendent after handling diphtheria patients goes to his office, forgetting to use soap and water, one feels that there is need of forceful instruction. Perhaps the most surprising violation of the canons of cleanliness was observed at the International Congress on Tuberculosis in

Washington. For two days a pitcher of water and only one glass was placed on the table beside the speakers in the different sections. While the United States has not deemed it wise to make treaties for reciprocal trade, the management of this scientific congress provided a most perfect mechanism for international exchange of the bacterial flora of the oral cavity. The surprising thing was that no one of this concourse of scientists, meeting to fight the most important infectious disease, saw any objection to this use of the most effective means of spreading infection. Moreover, most of the readers of papers carefully licked the forefinger to assist in turning the pages, evidently willing to test the pathogenicity of whatever germs their fingers had picked up from American car straps, American money and American water-closets. Meanwhile they grew somewhat bitter in the discussion as to whether 1 percent or 10 percent of tuberculosis is due to cows milk. Will you not agree that there is urgent need for an active propaganda for cleanliness in the management of contagious diseases?

DISCUSSION.

The PRESIDENT. Like everything else that comes from our associate this paper betrays the hand of a master. There is no part of it that does not appeal to every man in this room. There is only one criticism that I should like to make on it personally, and that is that I happen to represent a great hospital. That great hospital has done everything it can to encourage the use of vaccine. But I would also like to say, and insist upon it, that the hospital still does everything it can to enforce cleanliness among its nurses and those who come in contact with the sick. The Massachusetts General Hospital, for one institution in Massachusetts at any rate, is not open to the suggestion of Dr. Chapin that we substitute a vaccine for cleanliness. With that exception I think the paper is pretty nearly perfect.

Professor WINSLOW. The Association has seldom had a more valuable and important paper than this one, nor a more timely one, because this fight for this idea of the supreme importance of contact infection is one that is still going on. Of course the part played by contact has long been understood in regard to the exanthemata, but in the case of typhoid fever it has taken about ten years to get this conception of prosodemic or contact typhoid to take hold even in the minds of leaders in sanitary work, and the old view dies hard. An able sanitarian in the west has only very recently, in reviewing the report of the Typhoid Commission in Washington, expressed himself as unable to believe that there could be extensive contact typhoid if its course could not be discovered, and therefore concluded that Washington typhoid must be due to water, in spite of the fact that the Washington water supply is one of the best in the country; whereas the essential fact about this contact typhoid and about contact infection in general is that it is difficult or impossible in many cases to trace the particular ways by which the infection has traveled.

I believe, as Dr. Chapin suggested, that even in the case of tuberculosis our idea of the importance of contact is likely to grow stronger. I have had occasion during the last year or two to make some studies of this question, particularly in regard to the theory of mouth spray. Cornet's old idea of the spread of tuber-

culosis by dust has, I suppose, been pretty generally given up now as the result of the studies which have shown that, although the tubercle bacilli are more resistent than other germs, yet even they die out quickly when they dry, at least a great proportion of them die out, and the place of the dust theory has been largely taken by the mouth spray theory. It is certainly true, that germs are thrown out of the mouth in the spray, and that they are carried to considerable distances. Flügge in his original work was, however, very cautious in his statements, and took great pains to say that the danger practically was not great except in the immediate vicinity of the patient; but his experiments, which showed that germs were exceptionally carried for thirty or forty feet, have been widely quoted. In the average popular work on hygiene you see it stated that there is danger from the mouth spray for forty feet, but Flügge did not give that impression at all.

In some work that has been carried on at the Institute of Technology laboratories* we tried to get quantitative ideas of the extent of this danger, and we found that as a matter of fact the air pollution was very small indeed. A few of the germs are carried to a distance, but most of them fall down pretty rapidly. It is like rain falling through the air, not spray spread out in it; it is a rain that falls down from the mouth, occasionally a droplet is carried for twenty or thirty feet, but very rarely. The amount of air infection is almost infinitesimal when you measure it per cubic meter of air. The real danger from the mouth spray is much more like contact infection than aerial infection. If a person spits—that is what it amounts to—sprays out finely divided spit on some object, on somebody's hand or on an article of food; that is practically contact infection. The main danger does not come from particles carried across the room or across the street or to any distance. It is a kind of contact infection again, and contact infection in tuberculosis, when you consider this kind of pretty direct transfer and the danger from drinking cups and so on, must be immeasurably more serious than the possible danger that the germ may occasionally be carried twenty feet in the air.

The question we must ask now is not, Is such and such a thing dangerous? but how dangerous is it? We have passed through

*Journal of Infectious Diseases, VII, 17.

two stages in sanitary science and are passing into a third. In the intuitive stage the work of a sanitarian was directed simply against things that he guessed might be dangerous, like damp air and like the things that are guarded against in the Mosaic law. Then there came the rational period, when there were definite experiments that showed such and such things were dangerous. Now we are coming into the quantitative period, when we ignore the minor and remote dangers like sewer gas and aerial infection and infection through fomites, and attend to the things that are proven to be not only possible agents of disease but large and important agents of disease. On this transformation that has taken place from qualitative to quantitative sanitary science there is certainly no man in this country, and perhaps no man in the world, who has played so large a part and done so much admirable work as Dr. Chapin.

The PRESIDENT. It is the good fortune of the Association to have as its guest today a gentleman who represents the health administration of the great city of St. Louis—Dr. Jordan.

Dr. JORDAN, of St. Louis, Mo. I came to Boston a day or two ago with the idea of talking over with the local health officials their modes of procedure in the handling of contagious diseases and other sanitary matters, and I want first of all to say that through the kindness and courtesy of Dr. Durgin and Dr. Shea and Dr. Mahoney I have had opportunities to look into these matters in your city, not only in detail, but it has been made a pleasure, and I shall never forget this visit to Boston and how pleasant it has been to me.

In the matter of the transmission of contagions, it has been impressed on me that the men who are called upon to meet and handle and guard against contagions are the men who are awaking to the fact that all, or nearly all, infections are transmitted by personal contact. If we are right in that it means—or should mean—a revision of our quarantine restrictions. The question then comes up whether or not it is wise to make a radical change in those restrictions. For generations it has been the custom among the laity and among the profession too, to recognize indirect transmission of disease, and what has been accepted as a fact for generations is a mighty hard thing to break down. The minute you

withdraw the layman's accepted theory of the transmission of disease he is very likely to consider that all other theories are incorrect. But I have been impressed for many years, especially in the eruptive fevers, in smallpox, scarlet fever, measles, and diphtheria, especially in smallpox, that these diseases are not contracted except by personal contact. If a man has disease in his family, if one of his children is sick, and that man visits the family of a neighbor and the child or wife of that neighbor contracts the same disease, nothing can convince him and everybody else that that man has not transmitted in his clothing the disease from his home to the friend; whereas as a matter of fact that child or wife may have ridden in a street car sitting in the same seat with a mild case of that disease and not known it.

Perhaps the most striking instance in my experience, of the necessity of personal contact in transmission of contagion was during an epidemic of smallpox some years ago in St. Louis. We were obliged to employ a number of extra men to handle the work, among whom were two young men who were engaged to fumigate. These men, as all others, were required to report to the physician for the purpose of inspection, and vaccination if necessary. Both were opposed to vaccination, and in the rush they managed to evade. These men were placed on duty fumigating smallpox houses. I think it was some two months that they did this work, going into the house the next morning after the removal of a patient, picking up the bed clothes, hanging them over the doors and chairs, and breathing in any possible contagion that might be there. They did that for a period of two months without the least discomfort. I removed a colored man one evening from a house, and these men received the order the next morning to fumigate that house. When they went there for that purpose they found the brother of this negro in full eruption. They telephoned me and I instructed them to stay with him until I came. It was not more than three or four blocks distant from my office, and when I reached there, which was witin five minutes, I had the man removed. The men then went on with the fumigation. Exactly eleven days from that day both of them came down with smallpox. This to me was one of the strongest arguments for the necessity for direct contact.

I believe that direct contact can apply just as strongly to measles and to scarlet fever, certainly before the period of desquamation. Now, I have heard it disputed that the desquamation of scarlet fever could convey the disease. All authorities agree that it does, and most of them contend that it is the most contagious period of the disease. Diphtheria I am sure can be conveyed, as I believe any of the other diseases, such as typhoid fever or tuberculosis, can be conveyed, as long as the live bacilli can be transferred either into the respiratory organs or on to the mucous membrane. But we know in the past how mistaken was the idea of the indirect contact in yellow fever, how many million dollars worth of property, how many million dollars worth of clothing and goods have been destroyed with the idea that it was infected and capable of transmitting the disease, and yet today we know that the agency is entirely different and the mode of handling yellow fever has resolved itself simply to the application of the screen.

There is one thing that appeals to me to be most important, and that is the drinking cup. We have in our city, now pending, an ordinance abolishing the drinking cup and making its presence in a public place a misdemeanor, punishable by a fine. We have also pending a law providing that all places where food is kept— that is, kept uncovered— where it is consumed or offered for sale exposed, must be effectively screened so as to exclude the fly. These two things I think are very important. It goes without saying that the common drinking cup is unquestionably a carrier of disease. A person standing near a common drinking cup and seeing the procession that goes by, wonders that everybody in town that passes that way is not infected. How many people we have seen on the train that were evidently consumptives making trips back and forth to the drinking cup, and little children, and mothers, following and drinking out of the same cup. I think there is no question, either, of the agency of the fly. We can demonstrate that the fly will light on tuberculous sputum, that it will light on typhoid infected material; flies so infected have been made to crawl across a petri plate, and live, malignant bacteria have grown in their tracks. Who can question but that the fly is able to transmit the infection to food?

Mr. COFFEY. I would like to say a word in support of Dr. Chapin's contention that personal contact is more effective in the spread of contagious disease than fomites. In common with other people who are working in the interests of the public health my own inclination has been for years along those lines, and in support of it I would say that the isolation hospital in Worcester, in which we care for diphtheria and scarlet fever only, has now been in existence nearly fourteen years; the nurses and the resident physician live in the administration building, sleep there and come back and forth for their meals; during those fourteen years we have never had a case of scarlet fever or diphtheria among the help in the house, with one single exception. That one exception was within the past year. On investigation we found that a girl had a cousin patient in the scarlet fever ward, and unknown to the officers she went to the door while this cousin was convalescing and talked with her in the doorway of the scarlet fever ward.

The maids in the house wait upon the nurses at the table, take care of their rooms, change their bedding and do every thing that chambermaids and waiters do in any ordinary house, and yet we have never in those fourteen years had a case among the help in the house, with that single exception. During that time we have had something like 4,000 cases of diphtheria and scarlet fever treated in the hospital.

Dr. DENNY. It would be a pity if the enthusiasm which is aroused by a paper as stimulating as this should not have some practical result. Everybody here realizes that not as much is being done to prevent contact infection in typhoid fever as ought to be done. Typhoid fever is frequently held up as a type of a preventable disease, and the statement is often made that if every case of typhoid fever were surrounded by the same precautions as a case of cholera the disease would soon be wiped out. That is an extreme statement, but there is a good deal of truth in it. We need to see that every case is surrounded by precautions, so that there is no contact infection, and we need to see that every case when it is discharged is not a carrier. How is this to be brought about? We cannot expect the laity to take this matter up, or the Legislature. It seems to me that the initiative

for better work, for such work as is being done in Germany at the present time in stamping out typhoid fever, should come from this Association; and I therefore move, if it is in order, that a committee of five, to be known as the Typhoid Fever Committee, be appointed by this Association to take up the matter of the prevention of typhoid fever, to make recommendations to the society and to represent the society in any way in securing measures for stamping out this disease.

The motion was adopted and the following committee was appointed: Dr. Chapin, Dr. Denny, Dr. Brough, Dr. Davis, Dr. Tobey.

Dr. BROUGH. It is undoubtedly true that we find, especially in scarlet fever, diphtheria, and typhoid, and measles, that almost all cases are spread by contact. Not so very long ago, in a hotel where there were four cases of typhoid fever amongst the help, the proprietor of the hotel thought that it must be due either to milk or water, but upon investigation we found that one of the servants who was waiting on the table at which maids ate had a mild case of typhoid fever, and she caused those cases by personal infection. In another outbreak that occurred in a family in East Boston, a girl was taken sick with typhoid fever. Her mother attended her. The first child was removed to the hospital. Within a week, six others in that family came down with the disease. It was simply spread by the mother attending the first case, and the infecting the food and thus giving the disease to the others.

Dr. Doty, of New York, who has investigated the possibility of the spread of disease by money, suggests that since money is carried into many places where there is infectious disease it would probably be the most potent carrier if disease could be carried by fomites. Yet he has found no real example where money had transmitted disease.

While in most of the infectious diseases contact infection plays the most important part, yet I think smallpox, for instance, can be carried in other ways than by direct personal infection. Some years ago in the city of Cambridge there were a large number of cases. In the centre of the city one case of smallpox arose, and the man was treated at home throughout the course of disease.

In the houses in the immediate vicinity of that person, within a radius of perhaps twenty or thirty or forty yards, there developed a large number of cases of smallpox. There had been no apparent connection between that man, no direct personal contact between him and these people. We had some cases in the smallpox hospital in Cambridge, situated at the far end of that town. Following this original case I think some forty cases arose, and these forty cases were transferred to this hospital in the northern part of Cambridge. There had been no other cases in West Cambridge at that time, but it happened that we brought these forty cases there. The wind was blowing more or less steadily and constantly over towards West Cambridge. In the course of a couple of weeks or so we commenced to get cases from over in this part of the town, and before we got through I think we had some thirty cases there. There was apparently no direct contact, therefore I think it must have been carried by the air.

The same thing occurred in London. There was a hospital ship that carried smallpox cases up and down the Thames river. It was considered that the safest way to treat smallpox was to put the cases on this ship. As the ship moved up and down the river that shore toward which the wind blew most constantly would get the largest number of cases of smallpox. Thus it would appear that especially in the case of smallpox you can get the disease in other ways than by direct personal contact.

In the great majority of diseases with which health officials have to deal, such as scarlet fever, diphtheria and measles, infection is practically always due to personal contact. Perhaps that should make health officers more thorough in investigating the sources of these diseases, rather than for them to pay such a tremendous amount of attention to terminal disinfection. It is of a great deal more importance to discover one mild case of scarlet fever or diphtheria or of any other infectious disease than to disinfect a large number of rooms. The people in a community you will find are always eager to have the house disinfected, but they never think of looking over the others in the family to see whether there is not a mild case, or an unobserved case.

MODERN METHODS OF QUARANTINE.

By Prof. MILTON J. ROSENAU,
Boston, Mass.

Having had a certain amount of experience in quarantine work both in this country and abroad, and in both the temperate and tropical zones, and also in its general administration, I soon learned that there were all kinds of quarantine. In addition to maritime quarantine, such as this particular establishment,* there is land quarantine, hospital quarantine, house quarantine, interstate quarantine, cattle quarantine, good quarantine, bad quarantine, and I am even told that there are quarantines "for revenue only." Of course there are none such in our country, but in one of my trips to the tropics the boat dropped anchor at ——— and there I had the fortune (?) to see such a quarantine. After waiting a little while the quarantine officer came out in his little boat and approached the starboard companion ladder with the usual Spanish ceremonies, and finally came aboard. The captain told him that all were well on board, and without making any further examination of the ship or its papers, or of the crew and the passengers, he gave the captain a certificate granting the vessel free pratique to the port.

The quarantine officer then took a little rush basket that he carried with him, containing flowers of sulphur, and went forward and, passing the galley, got from the steward a saucepan, which he placed on the forward hatch in the open air. Into this he put a handful of sulphur and lit it. He then returned to the captain's cabin, and after a few words retreated. The captain afterwards told me that for the service of disinfecting the vessel, which was of some 7,000 tons burden, he received the usual fee of $50. That little handful of sulphur burned in the open air for a little while. The balmy summer breezes of the tropics blew the sulphur fumes directly into the forecastle and there disturbed the slumbers of some of the sailors, who were taking a rest. One of them came out quite

* From stenographic notes of informal remarks made at the Massachusetts Association of Boards of Health meeting of June 20, 1910, at Gallup's Island, Boston Quarantine.

angry and in a very original way, much to my surprise, extinguished the disinfection process in the same way that Gulliver once in his famous travels helped the Lilliputians with one of their conflagrations.

Quarantines—now I speak only of maritime quarantine—may be likened to jails and penitentiaries and other houses or places of detention. In that sense they are necessary evils, but somehow we will have to tolerate them for a long time to come. The very absurdity of the word "quarantine," coming as it does from the Italian word "quaranta," meaning "forty," is plain evidence that we are dealing with something that has to do with an imperfect social fabric. That word came from the practice of Venice, and other cities in the Hanseatic League—in the mediaeval times, of detaining vessels, arriving at the port of Venice, forty days, if they had pestilence on board. This was the first systematic application of maritime quarantine, and in modified form it has come down to us in the present day. Today, instead of forty days for any pestilential disease, we have five days in the case of cholera, we have five days and sometimes six in the case of yellow fever, seven days in the case of plague, twelve days in the case of typhus fever and fourteen days in the case of smallpox. Cases of leprosy are not allowed to land at all, provided the leper is an alien, in which case he must be deported in the same ship that brings him. In other words, now we only have six quarantinable diseases specified as such by law and regulations: cholera, yellow fever, typhus fever, plague, smallpox and leprosy. That is to say, we quarantine only against exotic plagues; we do not quarantine against the infections that are always with us, like typhoid fever, and tuberculosis, and scarlet fever, etc.

Formerly the list of quarantinable diseases was much larger. It included, for example, relapsing fever. But since certain sanitary improvements in our cities, which prevent the spread of relapsing fever, we are now no more afraid of this infection than we would be of a case of rheumatism. Only last winter a case of relapsing fever was taken without fear to one of the large hospitals in the city of Boston, and of course nothing happened.

Quarantine restrictions concerning other diseases have been greatly lessened during recent times. Typhus fever is a very good example of this. Formerly typhus fever prevailed in epidemic

form in this country; of late years we have little to fear from it. We did not know why, until the work that was done only this last winter. Nicolle of the Pasteur Institute, working in the northern part of Africa, and Ricketts (who unfortunately lost his life) and Wilder, representing the University of Chicago, working in the City of Mexico, where typhus fever prevails to a very great extent, and also Anderson and Goldberger, my former colleagues in the hygienic laboratory of the Public Health and Marine Hospital Service, have established now, I think, without any question, that typhus fever is another disease to be added to the long roll and the growing list of the insect-borne diseases. Through experiments upon monkeys the infection has been transmitted through the body louse, the *Pediculus vestimenti*. While the experiments have been few in number they have been positive and definite, and I think we may now accept without any question that this is the way in which typhus fever is spread. Although contact infection, as we all know and as Dr. Chapin has so ably presented it to us, plays a very important role in very many diseases, here is a disease, a type of a group of diseases, in which contact infection as such, so to speak, is not to be considered. This is a case in which bodily cleanliness, that is, simply freedom from lousiness, is the keynote for the prevention of the spread of this particular infection.

I do not mean to speak of all the diseases, but I can hardly pass over the list of quarantinable diseases without saying a word concerning plague. I am not familiar enough with the local traffic of the port of Boston to know how much commerce Boston has with plague infected countries—they are numerous enough—but I am sure that traffic is well guarded concerning the rats. Of course that is where the danger lies, much more than in personal contact or in cases of the disease. There is considerable danger, of course, in any port having trade or commerce either by boat or train with the plague infected regions, of importing the disease, and when it comes, it will come in the rats. Koch's work, that has been mentioned, gives the importance of "contacts" in typhoid fever and shows that the children play a very important role in spreading the infection of typhoid fever, as they frequently have the infection in mild and unrecognized form, an observation that we were able to confirm in our studies in typhoid fever in Washington. An enthusiastic German scientist drew the

analogy that children play the same role in spreading the infection typhoid fever that the rats do in plague, and then he went on, of course, to advocate the destruction of all the rats, but he did not have courage enough to provide the same prophylactic measure for the children.

Quarantine in its broad sense must be looked upon as a sieve, that is, as a filter, and not as a dam. Any system of quarantine that is built up like a Chinese wall to keep out disease absolutely by forbidding trade and travel and commerce is foredoomed to failure. No such system has ever succeeded. The principle that must guide the quarantine officer is to make the sieve of sufficient fineness, or rather of sufficient coarseness, to keep out the infection and let all the rest go through. If the sieve is too fine it is a great injustice to the traveling public, and to the vested interests, but if, on the other hand, it is too coarse and allows the infection to go through, the quarantine officer does not do his full duty to the country, the port and the state he is supposed to protect against infection, and there is where the great responsibilities, the important duties of the quarantine officer rest. I want to say that from my personal experience I can state that it is no small matter to stand on the deck of one of these modern vessels of more than 10,000 tons burden with perhaps about 2,000 people on board, all told, passengers and crew, and with several million dollars in the cargo, and to decide and quickly whether that vessel should be held in quarantine or be passed, and what is to be done to it. In other words, the responsibilities of the quarantine officer are very large as well as being very important.

Quarantine in another sense might be compared to a coast defence. Maritime quarantine guards us against an invisible foe that comes even more stealthily than hostile ships sometimes do in the fog, and the one system of defense is no less important than the other. I think the analogy so far as maritime quarantine to the coast guard is concerned is quite to the point.

A fully equipped quarantine station must consist, first of all, of an inspection service, to see what comes along. Next it must contain a proper disinfecting plant to destroy infection; it must contain barracks, or suitable quarters, where the crew and passengers may be detained during the period of incubation, depending upon the disease that is considered, and finally it must contain a

laboratory to recognize the mild cases, the carriers, and those diseases which are transmitted by "contact" and which are particularly dangerous because more or less invisible. In large ports like Boston it is not necessary to have a very elaborate laboratory directly connected with the station itself, because there are the facilities of the various laboratories at hand within the city that may be called upon at any critical moment. The modern quarantine methods of course are nothing more nor less than an application of the advances in the sanitary sciences and will not be dwelt upon in detail.

Now the cure for quarantine. We have called it an evil and something that is unnecessary. The cure for quarantine of course is sanitation. The city for example, that is free of the mosquitoes need not fear yellow fever. A city that has cleared itself reasonably of rats need not fear the spread of plague. A city that has a clean and protected water supply will never have one of those great water-borne outbreaks of cholera or other water-borne diseases, and so on throughout the list. Quarantines will be necessary until cities protect themselves by using the teaching of the sanitary sciences in the ways that are now very well understood. So that we might say that it requires no prophet to foresee the time when society will be developed to that state of civilization and the sanitary sciences will have reached that point of excellence when restrictive quarantines will be entirely unnecessary, but the millennium is a long way off, and I imagine that we will see little change in restrictive quarantines during our day and generation.

DISCUSSION.

Dr. DURGIN. I was thinking while quarantine was being discussed, of the purpose for which this building was erected 25 years ago. It was then customary to fear infection in old rags, and to hold them and certain other cargoes for disinfection. This building was erected for the storage of infected cargoes and the adjoining room was for disinfecting purposes.

I remember an instance when in 1866 the term quarantine at this port was not only fulfilled but extended to 42 days to exhaust new cases among a crew held on board ship. In 1867 this island was secured for quarantine purposes and all quarantinable cases and exposed persons found on vessels immediately removed to quarters here, the vessel disinfected and released.

In 1884 the first plant for public disinfection by live steam, was erected here and used for disinfecting personal baggage, clothing and such articles as could be so treated without injury.

Personal contact was very seriously feared. It is 43 years ago this month since my first cases of yellow fever were landed on this island when 5 from Havana were taken from a small vessel, The rags and the so-called fomites were removed to the island, and held until the frost came. It was believed then that fomites carried yellow fever and that frost would put an end to the spread of the disease.

Dr. BROUGH. May I ask Dr. Rosenau if it is not the custom in those countries that are perhaps less civilized than we are and that have more disease, to adopt most stringent quarantine against vessels coming from healthy ports. That is, do not the Latin countries quarantine a great deal more than we do here? Isn't it a tendency as a nation becomes more and more civilized to have less and less stringent quarantine?

Professor ROSENAU. It is undoubtedly true. Maritime quarantine measures naturally vary with the place, and especially with the fears of the people. Many quarantine measures are in excess, or are even recognized as absurd, and still forced upon the quarantine officer simply by the unreasonable fears of those who require absurd restrictions to be imposed upon trade and travel. I could quote specific instances.

Dr. BROUGH. How does the quarantine in countries like Great Britain and France and Germany and other countries compare with ours?

Professor ROSENAU. It is very hard to compare them, because their methods and requirements are quite different. Great Britain especially has instituted one system of quarantine that is very liberal, and to my mind very excellent, that is being copied more or less now by different nations. In certain diseases it permits passengers to land from a vessel and enter the country. Instead of quarantining them it simply keeps track of them during the period of incubation; for instance, if it is smallpox these individuals are required to report every day for fourteen days to the health officer after vaccination, if it is cholera they are watched for at least five days, etc. In this way there is very little restriction, there is no delay, and it certainly is much more civilized and a better way of conducting maritime quarantine than by an absolute barrier of keeping these people out altogether during the peroid of incubation. Upon the average over 99 per cent. of the detention that is enforced is shown to be unnecessary, as no cases develop.

Dr. DURGIN. One matter I forgot to speak of. I think the best quarantine is done at the port of departure. The examination of all passengers leaving foreign ports for America, and of the bill of lading, does much to prevent trouble on the ship and at the port of entry.

Professor ROSENAU. I perhaps purposely left out this very useful measure to which Dr. Durgin has referred, although it was fully in my mind, because I served over a year upon this work that Dr. Durgin calls quarantine work, and which very properly is quarantine work, but we usually referred to it when I was in the service as foreign inspection service. Although it was collateral and attached to and had the force of quarantine work, still we usually did not place it within that category. That is one reason why I omitted it. I would further like to endorse fully all that Dr. Durgin has said, because I then had opportunity to see its usefulness and value. I regret to state that through certain international difficulties the United States, which at one time did have these

foreign inspectors at a number of the important foreign ports, now covers only a few of them, one, Naples in Italy, another one for the entire territory of India and one in Yokohama. There is another foreign inspection service which is of the greatest use to the quarantine officer at the local port, and that is the system of information which the government collects through its consuls and consular agents and other persons abroad concerning the sanitary condition of the port from which the vessel sails and the places from which the passengers originate. This information is of perhaps greater importance to the quarantine officer at the port of entry than anything else.

Dr. DURGIN. I made the mistake of saying quarantine for inspection. Inspection is the word for the work done at the port of departure.

PERSONAL HYGIENE.

By PERCY G. STILES,
Assistant Professor of Physiology in Simmons College.

Sylvester Graham and the Dietetics of 1839.

We are constantly reminded that Americans of the present day are vastly interested in matters concerning nutrition. The newspapers and magazines devote much space to the subject, popular books on dietetics were never so numerous, and accurate scientific studies are pursued in many laboratories. This widespread interest proceeds primarily from the desire for health but it is powerfully stimulated by economic considerations. The high cost of food makes many people more willing to attend to the teaching that they should reduce their rations than they might be without this painful stimulus. In view of the prominence now given to alimentary hygiene it is worth while to review a period two generations removed from us in which a somewhat similar emphasis was placed upon many questions of diet and digestion.

Among the writers and lecturers of that time who dealt with these problems the Reverend Sylvester Graham was a conspicuous figure. His name is constantly applied to the coarse, unbolted flour which he made popular, but not much else is commonly recalled in regard to the man and his views. He was born in 1794 in Suffield, Connecticut, and he died in Northampton, Massachusetts, in 1851. His father was a clergyman of English birth and was educated at Oxford. He had high ambitions for his son but poverty and the boy's uncertain health combined to delay their fulfillment. The years of Sylvester Graham's boyhood were those of general distress preceding and including the War of 1812. Within this time he turned his hand to several commonplace occupations, working in a store and for a while in a paper mill, later teaching a country school.

He was twenty-nine years old when his circumstances at length made it possible for him to enter the college very recently opened at Amherst. He did not complete a regular course. We

are told that his talent for elocution did not impress his instructors as being of the right order for a preacher; his gifts as a speaker were marked but were held to fit the stage rather than the pulpit. So his course was interrupted and his purpose set aside. But after his marriage he prepared himself for ordination and was received into the ministry of the Presbyterian Church. It is not clear that he ever had a pastorate. From the influence which he afterwards exerted it is evident that he was a lecturer of unusual persuasiveness. His writings are somewhat diffuse but always clear and decidedly less formal than most expositions of the period.

The active years of Graham's life must have been stimulating ones for Americans and especially in the northeastern states. This was the time of which we get glimpses in Timothy Dwight's "Travels" and in the "Note Books" of Hawthorne and the journals of Emerson. The population was homogeneous and not yet disturbed deeply by national politics. It was a time when public works were rapidly advancing in scale and daring. People were enthusiastic over their country to a degree which irritated foreign travelers. The popular mind was plastic and eager to be informed. Theology was in a state of flux. Science and pseudo-science fascinated audiences in all the cities. It seems to have been easy to enlist support for moral and philanthropic enterprises—for missions, for education, and for the triumphant temperance movement. Almost the same ardor characterized those who became followers of mere fads. The general interest in Phrenology and the volume of matter published in regard to it was astonishing. Mesmerism was a word to conjure with.

Under such circumstances questions of hygiene were sure of a hearing. The conservatism of medical practice was widely distrusted. Homoeopathy had gained a large following and had demonstrated that much of the old-fashioned drastic dosing was needless if not hurtful. Mineral springs were proving to be exceedingly lucrative to thrifty promoters.

Sylvester Graham first gained a reputation as an able speaker when he made a tour of Pennsylvania in support of the temperance, or rather the total abstinence, movement. We are told that as he pondered upon the causes of intemperance he was led to the belief that a vicious diet was a most important one. With

an enthusiasm and a thoroughness always characteristic of the man he entered upon the study of dietetics. He was not content to be an amateur. Though his training had not been scientific he now accustomed himself to go to the best sources and he displayed a good faculty for criticism. His principal book was published after years of careful preparation.

It is an elaborate work in two volumes entitled "Lectures on the Science of Human Life." It appeared in Boston in 1839. John Fiske has humorously said that Boston showed certain of its present tendencies as early as the time when Anne Hutchinson gave lectures on Metaphysics before its housewives. A glance at the bookseller's advertisement inserted in Graham's "Lectures" proves that the seriously minded town was true to itself at this later period. For here we have listed books on "Physical Education," "Moral Philosophy," "The Social Relations of Man," "The Influence of Mental Cultivation upon Health," and, most interesting of all, "Dr. Brigham on the Influence of Religion upon Health."

Graham's first volume is for the most part physiology. There are frequent digressions into philosophy and moralizing but the science is there and few contemporaries could have compiled more wisely. The anatomy is laboriously clear. The descriptions of microscopic structures take us back to a time when investigators were just hesitating to make the grand generalizations of the Cell Theory. Organic chemistry was in the early years of its swift development and in regard to it Graham's book is inevitably deficient. But the mechanical factors in the preparation and transfer of aliment are carefully treated, with much recognition of the current work of Beaumont. The treatment of the nervous system is marked by temperate criticism of the Phrenologists whose views were in high favor at the time. It is instructive to note how well the principles of vasomotor changes were grasped years in advance of their precise demonstration by Bernard.

However, it is the hygiene of "Graham's System," which is of present interest, What we regard as modern emphasis characterizes it throughout. There is the familiar plea for optimism and control of the emotions. It is surprising to find a Puritan minister of seventy years ago seeking to connect "conviction of

sin" with dyspepsia! With a similar disregard of tradition he recommends dancing as a wholesome exercise. But it is in the field of dietetics that we find the teaching of our own time most perfectly paralleled. Fletcherism is the Graham System regenerated. In each good food, varied from day to day but furnished in few and simple forms at any one meal, is a primary prescription. Each reduces meat to a very subordinate place in the ration. Graham was himself a vegetarian but was content to teach extreme moderation in meat eating. "Slow and cheerful" eating—the words are Graham's, while the practice has its vogue today as never before. The good results claimed by Graham and by the able partisans of the low diet in this century are identical—betterment of general health, increased physical endurance, added alertness and perseverance in mental work. Individual cases are presented in painstaking fashion and in large numbers in Graham's volumes, the plan followed with scientific exactness by Chittenden in his recent books.

In technical language the modern teaching is in favor of a diet low in total quantity, notably low in protein, and containing a minimum of extractives. In popular speech this is a "light, unstimulating" diet. It is practically the ideal of the "Lectures" of 1839. At one point nevertheless there is a lack of agreement. This is in the matter of concentration. Graham believed in coarse food products and distrusted refining processes in manufacture. He did not therefore encourage the choice of condensed nutrients with the least possible waste material and he regarded constipation as an evil rather than a normal condition. In this he failed to anticipate the most singular article in Mr. Fletcher's creed.

VETERINARY HYGIENE.

By W. L. BEEBE, D. V. M.,
Bacteriologist for the Minnesota Live Stock Sanitary Board.

THE AGGLUTINATION TEST FOR GLANDERS IN PRUSSIA. From April 1, 1907 to March 31, 1908 in Prussia the agglutination test was employed in the case of all horses that had been exposed to infection and on all horses suspected of being infected with glanders.

The tests were carried out at the Pathological Institute of the Veterinary High School at Berlin, and in the Department of Animal Hygiene at the Kaiser Wilhelm Institute at Bromberg. The total number of horses tested was 1750, distributed in 342 establishments with 1847 horses altogether. Of these 1750, 283 were destroyed or died, and 177 were found to be glandered at the post-mortem. Of the animals destroyed sixty-nine were killed for other reasons than on account of the test, such as dispersal of the studs, etc.

In some cases the test was not completed, either because of the dispersal of the studs or because the owner objected to the repeated taking of blood.

During the two years from April 1st, 1906, to March 31st, 1908, the test was employed altogether on 3466 horses. Of these, 648 were killed and 395 were found to be glandered. 2085 horses, or 60.16 per cent. of the total number, showed a constant agglutinating power at 300-400, and 960, or 27.69 per cent., at 500-800, that is 87.85 per cent. of the total number tested.

Among the horses with an agglutinating power at 300-400 there were twenty-nine, or 1.39 per cent. which were found to be glandered. The percentage of glandered animals in this group was much lower during the second year, being twenty, or 1.91 per cent., in the first year, and only nine, or 0.87 per cent. in the second. Four of these nine horses were destroyed on clinical grounds, some before the result of the test was known, and some because suspicious symptoms appeared after blood had been taken the first time.

Among the animals with a permanent agglutinating power of 500-800 there were found fifty-five glandered animals, i. e., 5.73 per cent., in this group of horses.

Horses with an agglutinating power of 1000-1200 were nearly all killed, and those with a higher agglutinating power were destroyed without exception. In the group 1000-1200 about 60 per cent., and in the two groups 1500 and 2000 and over as many as 85 and 96 per cent. were found to be glandered. It was, however, not always possible to discover lesions of glanders at the post mortem of horses with even these high agglutinating powers.

The group of animals in which the agglutinating power of the blood was not constant arouses special interest. In a healthy horse the agglutinating power does not change within a short period, and the researches of Schutz and Miesner indicate that the agglutinating power rapidly rises within from five to eight days after infection with glanders, that it is maintained at this high level for some time and then gradually declines. It follows from this that all variations in the agglutinating power must be viewed as suspicious. In reality nearly all such horses were destroyed during the first years, and during the first year over 83 per cent. of the horses in which the agglutinating power increased were found to be glandered. This percentage fell to 55.77 in the second year. The group of animals with increasing agglutinating power of course also contains those animals which became infected just after the first test, and in which the disease was recognized later, before the appearance of clinical symptoms, by a rise in their agglutinating power.

It appears, however, that slight variations in the agglutinating power, e. g., from 600 to 500 and 400, and vice versa, may occasionally occur in healthy animals. Such variations are always highly suspicious; greater variations warrant slaughter, and smaller ones indicate a repetition of the test.

The total results of the agglutination test are held to indicate that this method of diagnosis is a valuable one for the early recognition of glanders, and that it is therefore valuable as an aid in the stamping out of the disease. By its means many glandered horses showing no clinical symptoms of the disease whatever can be discovered.

In the author's opinion all horses showing an agglutinating power of 1500 or over should be destroyed, and he holds that from

a veterinary-police point of view it is not a serious matter that when this plan is adopted some sound animals are destroyed. It would also be justifiable to destroy immediately horses with an agglutinating power of 1000. The animals of this group (1000-1200) numbered only 3.9 per cent. of the aggregate tested. During 1906 and 1907, 60 per cent. of these were found to be glandered. Hence by slaughtering all the animals in this group only 1.50 per cent. of the whole number tested would be needlessly destroyed.

The recognition of diseased animals in which the agglutinating power has fallen to a value which is also found in healthy horses is more difficult. In this case a decision can only be arrived at by observing variations in the agglutinating power, and therefore, as a rule, repeated tests are necessary. On such grounds fifty-five horses, or 13.9 per cent. of the 395 which were found to be glandered, were recognized as being diseased.

For the diagnosis of such cases intervals of several weeks must be allowed between the tests, and the observations thus became unduly prolonged. It is suggested that in cases of this kind an earlier diagnosis may be made by employing simultaneously the agglutination and binding-of-the complement tests.*

CONTAGIOUS ABORTION OF CATTLE. The existence of a contagious disease of cows, the most characteristic manifestation of which is the premature delivery of the fetus has been recognized by veterinarians and cattle breeders both in Europe and America for a long time.

In 1897 Bernhard Bang in Denmark found in the uterine exudate of a cow slaughtered during an attack of this disease before the abortion had taken place a small short bacillus with very interesting biological properties which he grew in pure cultures and produced the disease in healthy cattle. His results were later confirmed by Nowark. Recently Mac Neal and Kerr† have been able to demonstrate the Bang bacillus in this country, out of six clinical cases of abortion they were able to isolate the bacillus in two instances. They were also able to produce abortion in a guinea pig three and one-half days after subcutaneous inoculation of a pure culture of the bacillus isolated.

*Nevermann, Berl. Tierarztl. Wochens., No. 19, 1909, p. 347 E Abs. in Jour. Comp. Path. & Thery., Vol. XXIII, Part I, pp. 63-64.

†Journal of Infectious Diseases, Vol. 7, No. 5, pp. 469-475.

SANITARY ENGINEERING NOTES.

By ROBERT SPURR WESTON,
Assoc. M. Am. Soc. C. E., Boston, Mass.

THE PRODUCTION OR NEUTRALIZATION OF OZONE FOR WATER PURIFICATION AND OTHER PURPOSES*

Ozone was discovered by Van Marum, 1783; recognized as a separate gas in 1840 by Schonbein. Properties not studied until Berthelot investigated the gas beginning 1890. The article describes conditions of production. The commercial production by high tension electric agencies has been possible only since the development of the A. C. generator and the high tension transformer. According to Arrhenius very small quantities of water vapor favor, and considerable quantities of CO_2 retard production. Excess moisture should be removed; best method is refrigeration. Low temperatures increase stability of gas. Dust causes loss of O_3 by oxidation. Owing to contraction in volume, formation of ozone under pressure is desirable. The presence of Cl or nitrous oxides hinders formation. Hydrogen favors, if no water is formed. $SiFl_4$ assists production. Process is endothermous. Steinmitz's theory of production based on molecular motion, that is caused by ultra-violet and other radiations, is the one most generally accepted. Use of ozone as bactericide and bleaching agent well known. Use as dry sterilizing agent not yet practicable. It is particularly popular as a sterilizing agent for water and its practicability therefor simmers down to a question of cost. It does not change the appearance of the water, does not remove suspended matter, only bleaches and sterilizes. At the Pittsburg Homeopathic Hospital ozonized air is used for water purification and general sterilizing, also for dressing putrient lesions and as a general therapeutic agent mixed with the hospital atmosphere. As an adjunct to ventilating systems, it is useful as a deodorizer. Its industrial possibilities are limitless and it is a valuable aid to preservation in cold storage warehouses.

*Engineering News, Anon., also Editorial 03, 488-499.

In America plants of the Bridge system have been installed at Lindsay, Ontario, Baltimore County, Md., and Ann Arbor, Mich. In this system the air is passed through peculiar perforated openings so that each jet shall be surrounded by a brush discharge and should have to pass through these discharges also. The cost of treating water at Lindsay is given at $1.51 per million gallons and the results, especially the taste and odor removal have been said to be satisfactory. The process of Leon Gerhard of Brussels, developed by Westinghouse, Church, Kerr and Company of New York, has evolved from the Tindal process. The ozonizer is a modification of the Berthelot tube. It consists of concentric tubes of glass coated with tinfoil through which dried air under pressure passes in thin streams. Around each pair of tubes is an insulated chimneylike "barrier," the object of which is to assist the circulation of the cooling oil in which the tubes are immersed. The condensing action of the oil is of great assistance in the process. The water is ozonized by a combination of injectors and sprays working in an atmosphere of O_3. The ozonized air is very concentrated, containing 10 g. of O_3 per cu. m. and only traces of nitrates and nitrites.

In the Stynis system there are many novelties, the most striking of which is the maintenance of a uniformly low temperature in the generator. The ozonizers alone are rated at 250 g. of O_3 per hour at a concentration of 5 to 6 g. per cu. m. The electrodes consists of coils through which cold ammonia gas circulates. Alternate coils are anodes. Dialectic sheets are used between anode and cathode. Each coil carries so-called discharge straps and the cooled air is subjected to a brush discharge. The new generator it is claimed will yield 90 to 100 g. per K. W. hour at a concentration of 6 g. per cu. m.

The whole article is reviewed editorially and it is stated that there is no question as to the efficiency of O_3 as a bactericide and oxidizer of organic matter. Even imperfect mixtures of grossly polluted water and ozonized air in crudely contrived laboratory apparatus effect almost complete sterilization but such facts do not place the process for water purification on a commercial basis. The St. Maur plant has been longest in commercial operation and in spite of its bacterial efficiency and the combustion of organic matter causes no change in the physical appearance of the

water. In the DeFrise systems the water is pumped against a head of 30 feet, quite an economical factor. Data, especially cost and depreciation data, for most plants are incomplete. It is possible that some of the germicidal properties may be due to nitrogen oxides and acids. Purification by electrified air has a pleasing sound to the public, which is apt to consider a well-operated filter a frail thing full of holes. The capacity of ozone for color removal is called to mind. It must be remembered that the removal from water of suspended matter alone is accompanied in all cases by considerable bacterial removal and many cases by adequate purification. The cost of slow sand, mechanical filters, ozonization with and without preliminary filtration, and treatment with calcium hypochlorite are compared. The ozone treatment is best adapted to sewage polluted waters whose appearance is satisfactory. Waters of turbid streams are least suited to ozone treatment. O_3 process has to compete with the calcium hypochlorite treatment, which has nearly the same effect and is cheaper. One objection to O_3 treatment is that the electric apparatus is delicate and complicated and requires skilled attendance. The O_3 processes are not yet standardized and at present it is difficult to determine what gases would be best treated by ozone. On the other hand, the use of O_3 is unique in that it has almost no injurious effect on higher organisms, when used for food preservation, general sterilization in hospitals and elsewhere and as a special therapeutic agent is only at its beginning. Its use for water purification, however, should be carefully considered with reference to the special case under consideration before adoption.

NOTABLE BRITISH COURT DECISIONS REGARDING STREAM POLLUTION BY THE BIRMINGHAM SEWAGE WORKS. Eng. News Vol. 63, p. 462, 4–21–10. Also Eng. Rec. Vol. 61, p. 586, 4–30–10.

In 1899 the High Court of Chancery issued an injunction restraining the Birmingham, Tame and Rea Drainage Board from discharging the effluent from the sewage farms and lagoons into the River Tame. The order carrying the injunction into effect was not issued. Improvements were made and an appeal taken to the Supreme Court of Judicature, Court of Appeal, which court

discharged the injunction on the ground that at that time, March, 1909, there was no violation by the Board of the Public Health Act of 1875, since the effluent discharged from the sewage disposal works was of better character than the river water at that point.

The judgment is given with the salient points in italics.

Mr. John D. Watson, M. Inst., C. E., is chief engineer of the Sewage Works. Sir William Ramsey was the expert employed by the Court and upon whose report they based their finding. The opinion was handed down by the Master of the Rolls and concurred with by Lord Justices Moulton and Farwell.

SOME NOTES ON THE SEPARATION OF SOLIDS FROM SEWAGE AND WASTE LIQUORS. J. P. Norrington, Engineering News, **62**, 733.

Settled sewage is more easily purified by subsequent filtration. Ordinary settling tanks are expensive. The author describes modern continuous flow sludge separators including the German "sewage kettle" and the English combination of grit chamber usually settling tanks, the overflows from the latter consist of numerous skimming troughs. With domestic sewage the former removes about 70%, the latter operating with Dorchester "English" sewage, 96.5% of the suspended matter. One advantage of the continuous process is that sludge is removed frequently, sometimes practically continuously. Sludge so removed has higher fertilizing value.

THE GREATER PITTSBURG SEWERAGE AND SEWAGE PURIFICATION ORDERS. Anon. Engineering News, **63**, 179. As the result of orders, technically permits, issued by the State Department of Health, what bids fair to be a metropolitan sewerage district for the city of Pittsburg and a number of near-by boroughs and towns, will probably be formed. The 70,000 population on the Ohio River below Pittsburg have suffered outbreaks of gastroenteritis and typhoid as the result of pollution of the main source of water supply from the Ohio River.

COMPARISON OF CONTACT BEDS AND PERCOLATING FILTERS, J. E. Farmer. Engineering News, **62**, 278. The author gives results of comparison of the two systems. Well

distributed sewage is purified slightly better by 5-foot than by 7-foot percolating filters. The latter treat more sewage per square yard of surface and cubic yard of filter material. In four years contact beds lost 62% of their water capacity. Local conditions must be given before cost comparison can be stated definitely.

IS SOFTENED WATER A DESIRABLE MUNICIPAL SUPPLY? EXPERIENCE AT McKEESPORT, PA. A. G. Sandblad, Engineering News, **62**, 431. Because of trenchant criticism by physicians and laymen, author describes softening processes, particularly the Porter-Plark process used at McKeesport. Softened water contains less than 60 parts per million hardness. The water of the river before treatment is exceedingly hard and sometimes acid. The purified water is soft and potable.

SUGGESTIONS ON THE USE OF THE IRON AND LIME PROCESS OF WATER PURIFICATION. C. A. Brown. Engineering News, **62**, 546. In a long article the author describes the methods of adding coagulating chemicals to water, also the essential conditions of application, methods of testing alkalinity, permissible limits of alkalinity, conditions affecting coagulation, sedimentation and filtration of water so treated. The article contains many valuable practical points useful to superintendents of water works.

BIOLOGICAL LABORATORY NOTES.

By FREDERIC P. GORHAM,
Associate Professor of Biology, Brown University.
Bacteriologist, Providence Health Department.

ACTION OF SODIUM BENZOATE ON BACTERIA. Dr. C. A. Herter reports* that commercial food preparations to which sodium benzoate had been added in concentration of 0.1 per cent. were found in most instances to contain small numbers of bacteria, chiefly of the spore bearing kinds. He found that sodium benzoate in dextrose broth, in concentration of 0.1 per cent, only slightly or moderately inhibits the growth of *B. coli* and other intestinal bacteria, but that gas production may be considerably inhibited. In the yeast plant vegetation continues and a considerable formation of alcohol results in the presence of 0.5 per cent. of sodium benzoate in a favorable medium, but fermentation is markedly inhibited.

A DIAGNOSTIC STAIN FOR LIVING AND DEAD BACTERIA. According to G. Proca† living bacteria may be distinguished from those which have been killed by heat or by disinfectants by their reaction to 2 methylene blue stain followed by weak (1.10) carbol-fuchsin. The bacteria which were alive retain the blue stain while those which were dead lose the methylene blue and retain the red. The stains may be combined as follows: 8 c. c. concentrated carbol-fuchsin, 100 c. c. Loeffler's methylene blue. The mixture should stand 24 hours before use. After standing one minute the living bacteria appear blue, the dead bacteria red. Other solutions such as Giemsa's do not give such good results.

THE RELATION OF *B. COLI* TO MENTAL DISEASES. Gay and Stouthard report on the significance of bacteria cultivated from the human cadaver in 100 cases of mental disease.‡

*Journal of Biological Chemistry 7, 1909, 59.
†Compt. rend. de la Soc. de Biol. 66, 1909, No. 25.
‡Central. f. Bakt. I, Orig. 55, 1910, 117.

Cocci were found in the blood in 26 cases, in the cerebrospinal fluid in 34 cases; streptococci, blood 8 times, cerebrospinal fluid 2; pneumococci, blood 3 times; *B. coli* aerogenes group, blood 11 times, cerebrospinal fluid 25 times; *B. proteus* group, cerebrospinal fluid 7 times. Ten cases selected as showing most numerous spinal fatty degenerations showed *B. coli* either in heart's blood or cerebrospinal fluid or both in nine, and in eight they were present in large numbers. Eighteen cases yielded 40 or more colonies of *B. coli* from one or each source, eight showed extreme degree of Marchi degeneration, five relatively severe changes, and five considerable intraspinal change. They conclude that a definite relation must be assumed to exist between *B. coli* or its toxins and nerve fiber degenerations.

THE BACTERIOLOGY OF FRESH EGGS. M. E. Pennington reports* an investigation of the chemistry and bacteriology of fresh eggs.

In the 57 experiments reported 18 showed a decidedly greater number of bacteria in the yolk, 11 had the majority in the white, and 21 had an almost even number in each, while 7 were sterile. 36 different species of bacteria were isolated from the 100 eggs studied for this purpose. The technic employed in the bacteriological part of the investigation was as follows:

"Scrub the egg well in clean water. Soak in bichloride, 1 to 1000 for a few minutes. Wash off the egg with sterile water and place upright in a suitable holder. With sterile instruments crack the end and with sterile forceps remove small pieces of shell without rupturing the egg membrane below, until a sufficient space is made to introduce a sterile pipette.

Rupture the shell membrane with sterile forceps and with a sterile pipette withdraw about 2 c. c. of the white. Place this in a small tared flask containing broken glass and reweigh. Add 10 c. c. of physiological salt solution and shake for ten minutes. The glass cuts the white of the egg and the solution is fairly satisfactory.

Plate definite volumes as usual.

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*Journal of Biological Chemistry 7, 1910, 109.

Pipette off, so far as possible, the white of the egg leaving the yolk unbroken. With a sterile wide-mouthed pipette puncture the vitelline membrane and withdraw about 2 c. c. of yolk, which is placed in a tared flask and treated exactly as the white."

ACID-FAST BACTERIA IN HUMAN FECES. Dr. D. Moore Alexander of the Department of Hygiene and Bacteriology, University of Liverpool has conducted an investigation* of the acid-fast bacteria of human feces. In the course of his work he determined that 0.02 gm. was the largest amount of human feces that could with safety be injected subcutaneously into a guinea pig of average size. The animal survived occasionally after an injection of 0.04 gm. Death ensued occasionally after the injection of 0.01 gm. His technic was to inoculate at least two animals from each sample. One received 0.02 gm. the other 0.01 gm. One gram of feces was weighed in a sterile watch glass, rubbed up in a sterile mortar with normal saline and further diluted until the final volume reached 99 c. c. Of this dilution 1c. c. was injected into one animal, 2 c. c. into a second.

For the direct staining of acid-fast bacteria in the feces various technics have been suggested. Hamburger, quoted by Sahli† recommended the method of Strassburger. This consists of fractional sedimentation in the centrifuge, by which the larger particles of the feces are first thrown down from normal saline and a sediment procured by centrifugalization in alcohol. Page‡ and Park§ also consider this method the most suitable. The author, however, used the following method: A sterile glass rod was employed to remove a small mass or drop from soft or liquid stools onto a slide. A second slide was used to smear out this mass and a film made in a similar fashion to that by which a blood film is produced. This was dried in the air and fixed by heat in the Bunson flame. Stained in steaming carbol-fuchsin for five minutes, washed, tested with 25 per cent. sulphuric acid until only a faint pink appeared on rewashing, then faintly counter-stained with Loeffler's methylene blue.

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*Journal of Hygiene, 10, 1910, 37.

† Sahli, 1906, Diagnostic Methods, p. 440.

‡ Emerson, 1906, Clinical Diagnosis, p. 390.

§ Park, 1905, Pathogenic Microorganisms, p. 312.

The author demonstrated that the feces of 23 cases of pulmonary tuberculosis, in which acid-fast bacilli were demonstrated by the microscope, were capable of infecting guinea pigs with tuberculosis. 129 samples from non-tubercular cases were examined microscopically and no acid-fast bacilli were demonstrated. An intermittency in the appearance of tubercle bacilli in the feces was demonstrated which the author states may be connected with the flow of bile.

BOOK REVIEWS.

The Care of the Child. By Mrs. Burton Chance. The Penn. Publishing Co., Philadelphia, 1909.

This is a very excellent book for the purpose it is intended. The author states definitely in the preface that the work is not to supply medical knowledge, but to give the mother practical suggestions in the care of the normal child. This idea is carried out throughout the entire book.

The reviewer has read this book with a great deal of interest and feels that it will not only be a great help to the mother but to physicians and all others who are engaged in the care or training of children. It is intensely practical and has no superfluous theories or fads.

The many details in the care of the child which the busy physician takes for granted that the mother knows, or depends upon the nurse to teach her, are set down in a clear, concise and orderly manner. Every chapter in the book is worth careful study, but the chapters on the Value of Health, the Bath, Artificial Feeding, The Sick Baby, Care of the Well Child and Obedience are especially good.

It is a safe book for any mother to have and will be of inestimable value to a mother with her first baby.

FRANK H. LAMB.

Cincinnati.

ANNOUNCEMENTS AND COMMUNICATIONS.

SECOND CLASS RATES FOR SCIENTIFIC JOURNALS: House Bill No. 22239, granting second class rates to scientific journals whose subscription lists are made up largely from the membership of scientific organizations was held in committee at the request of the Postmaster General. We understand that it will come up for a hearing at the next session of Congress. Meanwhile such Journals will have to conform to the strict interpretation of the present postoffice regulations or lose second class rating.

THE TWELFTH ANNUAL CONFERENCE OF THE AMERICAN HOSPITAL ASSOCIATION will be held at the Planters Hotel, St. Louis, Mo., on Sept. 20, 21, 22, and 23, 1910.

FIRST ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR STUDY AND PREVENTION OF INFANT MORTALITY.

A special report on birth registration is being prepared under the direction of Dr. Cressy L. Wilbur, Chief of the Division of Vital Statistics of the Bureau of the Census, for the first annual meeting of the American Association for Study and Prevention of Infant Mortality which will be held in Baltimore in November. The report of the committee on Birth Registration will be presented at the session on Municipal, State and Federal Prevention of which Dr. Wm. H. Welch is chairman. The members of the committe on Birth Registration include in addition to Dr. Wilbur:

Dr. Wilmer R. Batt, Commissioner of Vital Statistics, Harrisburg, Pa.

Dr. Charles V. Chapin, Commissioner of Health, Providence, R. I.

Dr. John S. Fulton, Sec. General Int. Cong. on Hygiene & Demography, Washington, D. C.

Dr. John N. Hurty, Sec. State Board of Health, Indianapolis, Ind.

Dr. Wm. C. Woodward, Health Officer, Washington, D. C.

The meeting will open with a general session on November 9th. On the 10th and 11th there will be four special sessions as follows:

MUNICIPAL, STATE AND FEDERAL PREVENTION.

Chairman, Dr. Wm. H. Welch, Johns Hopkins Medical School, Baltimore.

Secretary, Dr. John S. Fulton, Sec. General Int. Cong. on Hygiene & Demography, Washington.

MEDICAL PREVENTION.

Chairman, Dr. L. Emmett Holt, 14 W. 55th Street, New York City.

Secretary, Dr. Philip Van Ingen, 125 East 71st Street, New York City.

EDUCATIONAL PREVENTION.

Chairman, Dr. Helen C. Putnam, chairman of the committee to investigate the teaching of hygiene, appointed by the American Academy of Medicine, 1903, Providence, R. I.

Secretary, Prof. Abby L. Marlatt, Department of Home Economics, University of Wisconsin, Madison, Wisconsin.

PHILANTHROPIC PREVENTION.

Chairman, Dr. Hastings H. Hart, Director Department of Child-Helping, Russell Sage Foundation, 105 East 23rd Street, New York City.

Secretary, Mr. Sherman C. Kingsley, Supt. United Charities, Chicago, Ill.

The officers of the association are:

President, Dr. J. H. Mason Knox, Jr., Baltimore.

President-elect, Prof. Chas. Richmond Henderson, Chicago.

Vice-President, Prof. C.-E. A. Winslow, Boston.

Vice-President, Mr. Homer Folks, New York City.

Secretary, Dr. Linnaeus E. La Fetra, Editor, Archives of Pediatrics, New York City.

Treasurer, Mr. Austin McLanahan, care of Alex. Brown & Sons, Baltimore.

Every section of the country is represented in the directorate.

The headquarters of the association are in the Medical and Chirurgical Faculty Building, 1211 Cathedral St., Baltimore, Md.

For information or circulars write to the executive secretary, Gertrude B. Knipp.

AN OPEN LETTER CONTRIBUTED TO THE NEW YORK TIMES REGARDING THE ANTI-VIVISECTION EXHIBIT OF THE NEW YORK ANTI-VIVISECTION SOCIETY.

To the Editor of the New York Times:

There has been held in this city during the past ten weeks a public exhibition purporting to demonstrate the methods that are employed in laboratories of animal experimentation. It is held under the auspices of the New York Anti-Vivisection Society, an organization which for the past two years has endeavored in various ways to keep itself in the public eye. The exhibition has attracted less attention from the public than it deserves, for, while its scientific character may be questioned, it is valuable as affording a clue to the moral character of an organization which lays claim to a position of moral leadership. There are some of us who have entertained grave doubts as to whether this claim is justified, and these doubts have increased as the various successive acts of the society have been performed since the day of its birth. A study of its exhibition tends to increase these doubts.

The most graphic feature of the exhibition is an array of stuffed animals, some attached to operating tables, some with heads attached to surgical head-holders, some in partial dissection, with surgical instruments lying about, and in one case with a pool of red liquid, simulating blood. The good taste manifested in the public showing of such gruesome sights may well be questioned, and especially in view of the fact that a considerable number of the visitors which one sees at the exhibtioin are children. They are not only welcomed and allowed to roam freely about the room, but the unpleasant details of the exhibit are explained to them by the women attendants in charge, and a morbid curiosity is thus encouraged. The walls bear many pictures of animals, some undergoing luridly red surgical operations, some exhibiting anatomical dissections, and others participating in a variety of scenes of happiness or misery. The investigator is now and then shown, with a face of diabolical glee, gloating over his victim. A considerable number of portraits of men are shown, chiefly literary men and clergymen, with extracts from their writings, expressing more or less opposition to animal experimentation. In many cases these expressions are direct

responses to requests by members of the society, and their language shows the degrading influence of the literature circulated by the society.

A significant part of the exhibition consists of the tales that are told to the visitors by the women attendants. Of the various operations that are portrayed or suggested, one is frequently told that they are customarily performed without anaesthetics, a statement which is not rtue. One attendant said to a visitor that the surgical head-holders were used for the purpose of breaking the jaws of dogs, and that this was done without anaesthetics. When questioned as to the reason for breaking the jaws of dogs she confessed ignorance. Such a procedure is so patently fantastic as to render comment unnecessary. There is an oven, heated by gas burners which contains the stuffed body of a rabbit, and which the attendant tells you is used for the purpose of baking live animals to death, and that this also is performed without anaesthetics. Fabrication and grotesqueness here reach their culmination, for the oven is an apparatus intended for the incineration of dead organic matter, the anatomical refuse of a laboratory! The attendants are ever ready to discuss animal experimentation, seemingly quite unaware of their great and prejudiced ignorance. They do not hesitate to speak of well-known and highly respected scientific men in intemperate language that is anything but refined or parliamentary.

To one who is familiar with laboratory procedure, the keynote of this exhibition is falsity. The visiting layman can hardly fail to carry away with him a wholly incorrect notion of what animal experimentation means, what its methods are, and what a measureless amount of good it has accomplished for both the human race and the lower animals. Nowhere is there a sincere desire for the truth; everywhere there is ignorance, misrepresentation, and false implication; everywhere the calmness of balanced judgment is wanting; everywhere there is an unbridled appeal to sentiment, and to sentiment inflamed into passion. The harm is great that may thus be done to the individual, but when such an influence is allowed to spread unchecked through a community the harm that may be done to the multitude is incalculable. Such an influence is both intellectually and morally

debasing. When a Bishop of a Christian Church, innocent of the truth and moved only by a blind rage excited by the misleading tales of this society, writes of the beneficent method of animal experimentation, a method from which he and his followers unwittingly derive daily blessings. "I have long been an enemy to vivisection, and am so still," * * * I would like to see it totally abolished and made an offense against the law. * * * I am heartily in sympathy with the effort, not only to reform, but to destroy and root out altogether this sin against the lives of innocent creatures," we may well ask whether the time has not come for enlightened people to band themselves together in opposition to this variety of fatuous fanaticism.

In the exhibition of which I write the most striking single exhibit is the New York Anti-Vivisection Society itself. It has had every opportunity to learn the truth or the falsity of its demonstrations and its declarations. It has been told by those who know how untrue they are, and yet it has continued week after week to keep its deceptive sights before the public and to tell its false tales. In the minds of those who both know and respect the truth the New York Anti-Vivisection Society stands, under the deceitful mask of a pretended moral leader, as an obscurantist, a partisan of vicious principles and practices, and a foe of the public good.

PROF. FREDERIC S. LEE,
Professor of Physiology in Columbia University.

SECOND INTERNATIONAL CONGRESS OF ALIMENTARY HYGIENE AND OF THE RATIONAL FEEDING OF MAN.

UNDER THE PATRONAGE OF THE BELGIUM GOVERNMENT, OCT. 4–8, 1910.

DEAR SIR:

The authorities of the above Congress have requested me to organize the American Committee and to secure a discussion of the subjects which have been proposed for consideration in the Congress. The business of the Congress will be considered in seven sections, as follows:

SECTION I. Biological Physics and Energics.

SECTION II. Physiology and Physiological Chemistry—Rational Nutrition-regimen and Dietary.

SECTION III. Hygiene of Nutrition—Bacteriology—Parasitology and Alimentary Intoxication.

SECTION IV. Composition of Foods. Analyses of Foods. Adulteration of Foods.

SECTION V. Potable Waters.

SECTION VI. Legislation—Repression of Frauds—Inspection—Statistics.

SECTION VII. Inspection of a popular character concerning rational feeding and alimentary hygiene—co-operative societies, food administration, the food of charitable institutions, food in its different sociological relations.

In acceding to the request for co-operation in this work please signify the section in which you desire to be enrolled, and also on what one or more of the subjects you will prepare a paper.

The above named problems are of the greatest interest and it is hoped that all persons in this country engaged in their study may take an active part in securing the proper representation from the United States in the Congress.

The membership fee is twenty (20) francs. Relatives of members are entitled to the privileges of associate members on the payment of ten (10) francs. Intending members may send their subscription directly to the Brussels office, addressing M. Grognard, General Secretary of the Congress, 3 Rue de Louvain, Brussels, Belgium, or to Mr. Sterckx, Treasurer, Chief of Division, Minister of the Interior and of Agriculture, Brussels. If preferred, intending members may send their check (four dollars) to me at the address given below, and I will forward it to Brussels. The difference between the four dollars and the twenty francs will be used in paying the expenses of postage, etc., of the American Committee.

Respectfully,

H. W. WILEY,

Cosmos Club, Washington, D. C.

AMERICAN JOURNAL OF PUBLIC HYGIENE

Official Organ of the

Massachusetts Association of Boards of Health
and The American Public Health Association

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B. R. RICKARDS, 1404 EASTWOOD AVE., COLUMBUS, OHIO.

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(New Series—Vol. VI, No. 4)

EDITORIALS

THE JOURNAL OF THE AMERICAN PUBLIC HEALTH ASSOCIATION: AN ANNOUNCEMENT.

With this issue, November, 1910, the AMERICAN JOURNAL OF PUBLIC HYGIENE *appears for the last time as a quarterly. Beginning January, 1911, it will take an assured place as a monthly, representing professional public hygiene, as it always has done, but under the title and with the added dignity and prestige of the* JOURNAL OF THE AMERICAN PUBLIC HEALTH ASSOCIATION. *It thus becomes an International Journal representing the profession of public hygiene in Canada, Cuba, Mexico, and the United States.*

A full account of the aims and methods of the new Journal which are identical with those of the present Journal, will appear in its first issue. A brief resume of the history of the present Journal seems appropriate for the present issue.

In the issue of the Journal of the Massachusetts Association of Boards of Health of November, 1903, appears the following statement:

"THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH *was organized in Boston, March, 1890, with the following objects: The advancement of sanitary science, the promotion of better organization and co-operation amongst local Boards of Health, and the uniform enforcement of sanitary laws and regulations.*

"The Journal of this Association has for thirteen years faithfully reflected the views of the public hygienists of Massachusetts. As the only one of its kind in Massachusetts, the Journal has had its own field, which, however, it has not yet fully occupied. With the October issue of this year, 1903, a policy of expansion was adopted. The subscription list showed an immediate and most gratifying increase, so that this, the second issue, has a total circulation of three hundred per cent. over that of the July issue.

"The Journal will contain the papers read at the meetings of the Association, verbatim reports of the discussions, editorials, abstracts, reviews, and hygienic notes of professional interest."

A year later further expansion to a national standard was undertaken, and subsequent issues contained the following statement:

"With the November issue of the year 1904, the encouragement received from many hygienic quarters induced the Massachusetts Association to undertake the expansion of the Journal to a national standard, with the co-operation of many sanitarians as editors. A new title, (American Journal of Public Hygiene), was selected, while the older and well-established title, (Journal of the Massachusetts Association of Boards of Health), was retained also."

In November, 1907, the American Journal of Public Hygiene became the official organ of the Laboratory Section of the American Journal of Public Hygiene in addition to continuing its close and cordial official relationships as the organ of the Massachusetts Association of Boards of Health. In this issue the following statement was made by its managing editor.

"With the assumption of its new duties it has dropped its sub-title, becoming now the American Journal of Public Hygiene, a title expressive of the exact field it aims to cover.

"By the new arrangement, all members of the American Public Health Association receive this Journal, while the present subscribers and members of the local association profit by the added valuable material with no increase in price.

"We trust this is but one step toward the consummation of what seems to the editorial staff most desirable—a closer relationship between the various local public health organizations and the national association."

In February, 1909, the American Journal of Public Hygiene became the official organ of the whole American Public Health Association. In this issue the following statements were made:

"*Five years ago, foreseeing the need for a national publication devoted exclusively to the public hygienist and sanitarian, this Journal (American Journal of Public Hygiene) was launched. As previous to that date the Journal had been but the mouthpiece of a state public health organization it was some little time before the country at large could look upon it except in that light. As with most other ventures of the kind, the fight has been an uphill one against heavy odds, and the time and energy of the editors have been put into the work without thought of reward except that which may have come from the results obtained. Credit is largely due to the present Associate Editor for his foresight in perceiving the field which the Journal might sometime fill, and to the Massachusetts Association of Boards of Health for its loyal backing.*"

That due credit may be given to those concerned it should be stated that the publication of the original Journal of the Massachusetts Association was under the supervision of Dr. Samuel H. Durgin, who continued as chief editor under the various reorganizations to the present time. From 1903 to 1906, Dr. H. W. Hill acted as managing editor, then becoming associate editor. From 1906 to the present time, Mr. B. R. Rickards has been managing editor. He becomes by election of the Journal Committee of the American Public Health Association, managing editor of the forthcoming Journal of that Association.

CORRELATION OF PUBLIC HEALTH MOVEMENTS THE CALIFORNIA PLAN.*

There are now sixty-nine National Associations organized to deal with the various phases of improvement in the social and health conditions of the public. Fourteen of these are concerned solely with promoting the public health. Many of the others have important sections on health conservation. The people of the United States are the source of membership and revenue for these associations, and the ultimate recipients of their activities. An analysis of their annual reports and investigation of their operations in every section of the country will convince any observer that there is need for correlation and even elimination of much of the work now being done.

The California plan provides for a business alliance among the several State associations engaged directly or indirectly in public health conservation. The terms of this alliance are not intended in any way to interfere with the individuality or policies of the component associations. The constitution is extremely simple, the essential features being a board of forty directors and an executive committee of nine. The function of this board of directors is purely advisory. The work of the executive committee is carried on through three standing committees. All reports and recommendations of the executive committee go to the advisory board for approval before presentation to the component associations for consideration and recommended adoption.

The three standing committees are as follows: Committee on Educational Policies; Committee on Administrative and Financial Methods; Committee on Legislation. The Chairmen of these respective committees are members of the executive committee—two other members of each of these committees are members of the advisory board living within frequent meeting distance of the chairman. Added to this working nucleus are twelve members of each committee chosen from the combined membership of the

component associations according to the geographical distribution of the State's population.

The Committee on Educational Policies has two general functions: (1) to make comparative studies of the educational work of all the component associations and their divisions; (2) to direct the common interests of program and arrangement for the several associations. The first function will be discussed later in conjunction with the duties of the general secretary.

The second function may be outlined briefly as follows: Local Committees on arrangements and program are appointed for population districts of 30-50 miles radius. These local committees are divided into two divisions: (a) program and schedule details, (b) lecture hall and demonstration facilities. The members of the first division prepare calendar schedules of all lectures and public events of every sort that are announced, and suggest open dates for public health lectures. They prepare travel schedules for each proposed lecturer, and outline the order in which public opinion will probably favor the presentation of health topics. The members of the second division tabulate the available lecture halls, etc. in their district, the respective seating capacities, lighting, heating and ventilation facilities; the costs of rental for various meetings; the open dates; facilities for open air lectures and other data of importance. They arrange for meals and lodging for speakers who have to remain over night. They provide for the details of demonstrations or lantern slide exhibits. In short these local committees are composed largely of representatives from the various local public health, medical, commercial, charitable and church organizations, and serve as clearing house agencies for all matters common to all the associations. These committees do not attempt to take the place of local societies of the component associations. Upon the latter devolves the responsibility for advertising their own lectures, for providing traveling expenses of lecturers, for distributing their own literature and for advancing their special interests generally.

These local league committees carry on their work under the direction of the central standing committee. The latter in co-operation with the officers of the component associations maintains a lecture board, which is organized and operated as

follows: In each population district from four to six local lecturers of known ability are selected upon their promise to give three or four lectures annually for the League, the subject, date and place for each lecture to be assigned as required. The Committee then arranges with each component association for a series of skeleton outlines of lectures—three or four in number—which will give an accurate idea of the purposes, the work being done and the needs of each association. These outlines are accompanied by full data on the history, statistics, etc. of each association. Such of these lectures as it is desirable to illustrate with charts, exhibits and lantern slides are referred to the State Board of Health for the preparation of material.

The committee then arranges in conference with all the component associations a general plan of campaign and adjusts the tentative tours of special lecturers, so that two or more special "crusades" will not be operating in the same territory at once. The schedules for the local lecturers are also planned at this time. Thus it will be seen that no great burden of work falls upon any individual identified with this administrative mechanism, nor is the freedom of any participating organization unduly limited thereby.

The Standing Committee on Administrative and Financial Policies likewise has two functions: (1) to make a comparative study of the administrative details and the methods of financing the component associations; (2) to serve as a bureau of information on the lowest costs of stationery, signs, printing and other supplies; to furnish estimates on construction and maintenance of sanatoria, clinics, day camps, playgrounds, etc.; and in so far as may be requested to serve as treasurer and collector for the component associations.

The Committee on Legislation has two functions: (1) the collection of legislative measures proposed for presentation to the State Legislature, County Supervisors, or City Boards of Trustees; the study of these measures in the light of similar previous enactments in California or elsewhere, and the suggestion of such modification or amplification as experience has suggested: (2) the aiding of local societies in procuring the enforcement of public health laws, and the overcoming of unwarranted prejudice against the enactment of desirable ordinances.

Mention has been made of the Executive Committee and the Board of Directors. The Executive Committee members are so distributed that with the presence of the general secretary a quorum may be called in any one of three sections of the State—i. e. Sacramento, (the State Capital and a central point for the interior valleys); San Francisco, (central for the coast counties and the bay cities); Los Angeles (central for the southern section of the State. To this committee many matters for adjustment or advice are referred from the standing committees and from local societies of the component associations.

But the Executive Committee has other important functions: The General policies of the League, its relations to other state associations not identified with public health work, the consideration of reports of the standing committees prior to presentation to the board of directors. All these things require time and thought from the Committee. Another function is the arranging for an annual meeting of the League. This is held the day before the meeting of the state medical society. The program consists of a joint meeting of all the delegates in the morning for the presentation of administrative subjects of common interest, afternoon section meetings of closely related component associations, a business meeting at 5 p. m. for election of officers, board of directors and executive committee, and an informal dinner at 7 p. m., during which brief talks are made concerning the work for the coming year.

Necessarily the secretary of the League is responsible for keeping the work progressing steadily and smoothly in all parts of the state, but his most important duty consists in collecting data for the comparative studies being carried on by each of the standing committees. It is through the findings of these investigations that the League hopes to standardize the methods of the component associations, to aid in the extension of their influence to every part of the State, and to build up a broad conception of the health conservation movement.

The president and vice-presidents of the League are of statewide reputation for their business ability and active participation in philanthropic work. It will be evident that the endorsement of a Society or of its financial agents by the League is valuable.

To the president, vice-presidents and secretary of the League, as a committee, are entrusted the investigations upon which all such endorsements are based.

The policy of the California State Board of Health has been to aid all volunteer public health movements in every way possible rather than to take the lead itself. The State Board believes the League has entered a most valuable field of usefulness, and consequently extends its full co-operation and influence in this pioneer work. A special division of the monthly State Bulletin is devoted to "Progress of the California Public Health League," and also carries the following explanatory page for the information of the general public:

PARTIAL LIST OF PUBLIC HEALTH ORGANIZATIONS OF CALIFORNIA.

(A). CALIFORNIA PUBLIC HEALTH LEAGUE.

President, Mr. A. Bonnheim, Sacramento.

Secretary, Dr. William F. Snow, Sacramento.

NOTE.—The League is made up of the Associations indicated by a (*) in the list given below. The purpose of the League is to serve as a clearing house for all the common interests of the societies composing its membership. All correspondence should be addressed to the Secretary, Sacramento, California.

(B). ORGANIZATIONS WHICH ARE ACTIVE ALONG SPECIAL LINES OF HEALTH CONSERVATION.

I. Associations for the Prevention of Tuberculosis.

1. *California State Association for the Study and Prevention of Tuberculosis. President, Dr. F. C. E. Mattison, Pasadena; Secretary, Dr. George H. Kress, Bradbury Block, Los Angeles.

2. Affiliated Branch Societies: Alameda County, Long Beach, Los Angeles, Monrovia, Pasadena, Redlands, Sacramento, San Diego, San Francisco, Santa Ana, Santa Barbara, Sierra Madre, Stockton.

II. Associations for the Prevention of Syphilis and Gonococcus Infections.

1. *California State Association for the Study and Prevention of Syphilis and Gonococcus Infection. President, Dr. John C. Spencer, Butler Building, San Francisco; Secretary, Dr. R. A. Archibald, Department of Health, Oakland.

III. Associations for the Improvement of Milk Supplies.

1. *California State Association of Medical Milk Commissions. Dr. Lewis Sayre Mace, Chairman Executive Committee.

2. Affiliated branch commissions: San Francisco, Los Angeles, Oakland, San Jose, Sacramento, Santa Barbara.

3. San Francisco Milk Improvement Association.

IV. Associations for the Improvement of Child Hygiene.

1. *California Playground Association. President, O. K. Cushing, First National Bank Building, San Francisco; Secretary, C. E. Hudspeth, 781 Fifty-ninth Street, Oakland.

2. Local associations: Los Angeles, Oakland, Sacramento, Fresno, San Jose.

V. Miscellaneous Associations Carrying on Important Public Health Work.

1. *American Red Cross. There are chapters in San Francisco, Berkeley, Los Angeles, Stockton, Sacramento and Napa.
2. *California Federation of Women's Clubs.
3. *California Teachers' Association.
4. *California Press Association.
5. *State Charities Aid Association.
6. Anti-Mosquito Associations.
7. Association of Collegiate Alumnæ.
8. Civic Department, California Club, San Francisco.

This list is incomplete and will be changed each month as corrections and additions are sent in.

Names of officers and information concerning these associations will be sent on application to the State Associations listed, or to the Secretary of the State Board of Health.

The League is yet in its infancy, but already has shown evidence of good results. This brief outline is given in the hope that other States may be stimulated to institute modifications of the California plan which will in time lead to the general adoption of a uniform plan which may be made the unit-basis for a national fusion of the many unco-ordinated elements of the great health conservation movement.

WM. F. SNOW.

Secretary, California Public Health League.

THE REAL REASON FOR STATE AND MUNICIPAL MEAT INSPECTION.

The subject of state and municipal meat inspection has received much consideration in America in the last few years, but little has been done to improve conditions. It would seem as though action should be taken by sanitary authorities to remedy these difficulties, when we take into consideration that only about half of the meat that is eaten in this country is killed under adequate inspection. The United States Bureau of Animal Industry, Department of Agriculture, has in the last few years, remedied many of the defects that exist in government inspection. Meat that is stamped "U. S. Inspected" can be considered as wholesome and fit for food.

The conditions that surround the small slaughter houses, such as are found in the cities and small country towns, are almost appalling. In many instances they are far worse than those surrounding the most unsanitary dairy barns from which health officials would not allow milk to be sold. In the State of Indiana recently a sanitary inspection of 327 slaughter houses showed that only 7% fulfilled sanitary requirements. The buildings where animals are killed are usually located outside the corporation limits, frequently on banks of streams, and the drainage is usually toward the creek. Old dairy cows are frequently killed in such houses and from the prevalence of tuberculosis in these animals, it will be seen that the disease is transmitted to swine and other small animals that are usually kept around slaughter houses, as in most cases the offal is thrown out to be eaten by rats and hogs or washed away by the water, which may be used for watering stock lower down stream. Hog cholera and parasitic diseases are frequently transmitted by these sanitary methods of disposing of offal.

While it has been shown by authorities on meat inspection that there is some danger from eating meat from animals affected with infectious and parasitic diseases, this is not the only point that should be considered, because meat is generally cooked before eaten. The large packing-house establishments where Federal inspection is maintained, have in the last few years, refused to accept hogs from certain of the old hog-raising districts unless

sold subject to inspection, owing to the fact that tuberculosis is so prevalent that the loss that they have to withstand prevents them from making any profit on these animals. The question now arises, what becomes of the hogs that are refused by the large packers, providing the farmers will not submit to sell them subject to inspection? They many times will not do this as in this case they have to stand the loss that is caused by tuberculosis in their animals. Consequently they sell them to the smaller establishments that are without inspection and the people eat the tuberculous meat. Federal meat inspection has shown that the number of tuberculous hogs has raised from 1% to over 4% in the last ten years. What is the cause of this? It is due in most cases to the feeding of skim-milk that is returned from creameries and to the fact that farmers allow the pigs to follow the cows and pick food out of the feces. This increase is very alarming and something should be done to prevent it. If state and municipal meat inspection were practiced in this country and all of the food-producing animals that were sold would in some way be marked, so that they could be traced to the owner; perhaps as Rogers* suggested, to tag each animal with a metal tag showing a number and records of the numbers of the tags kept so that the seller could be located, all animals killed for food could be inspected in an efficient way and much could be done to locate and eradicate tuberculosis and other infectious diseases that affect food producing animals. Tagging would, however, be futile, until state and municipal inspection is maintained, as farmers would be suspicious and sell their animals to establishments where they would not be inspected, not realizing that it was for their own interests to check the spread of these diseases.

One objection that is raised by many municipalities and states is that meat inspection is too expensive for what is gotten out of it, but we should take into consideration the amount of money that some states are paying to eradicate tuberculosis by reimbursing the owners of tuberculosis animals which the state has destroyed and that little is being accomplished in this way in locating infected herds. If only a small portion of this money were utilized for maintaining and requiring all animals sold for slaughter to be tagged, we could soon locate most of the infected herds, as sooner or later some of almost every farmer's hogs or

* Report of Sixth International Congress on Tuberculosis, Sec. VII, pp. 837.

cows find their way to abattoirs under municipal, state or federal authorities, and if one of these animals were found to be infected we would have evidence that tuberculosis existed on the owner's farm, and adequate police regulations could be enforced. In Europe over 600 municipal abattoirs are in operation. Modern machinery is used which saves much of the offal that is now thrown away in the smaller institutions. Recently Dr. Farrington* Assistant Chief of the Bureau of Animal Industry, United States Department of Agriculture, published an article in which he stated that fat cattle dress only about 60% of the live weight, and if modern machinery were installed and up-to-date methods adopted, packing house statistics show that the value of the hide and offal would increase the valuation of a fat steer from 60% to 75%. In other words, the 40% offal would be equivalent to about 15% of meat. It would, however, be advisable for all states to enforce tagging of animals as otherwise farmers would ship their animals to states where they would be killed without inspection.

One obstacle that city health officers have had to contend with in trying to establish municipal meat inspection is that dealers usually want to kill animals either very early in the morning or late at night, so that they can use the butchers for other purposes during the day. The slaughterhouses are frequently located far apart and in inaccessible parts of the city. If efficient inspection were established, it would require a corps of inspectors to do this work. Hence, the only solution of the problem lies in building a municipal abattoir, centrally located. (The present sanitary system obviates odors so that it could be situated in a business district.)

The question has frequently been raised, who should supervise meat inspection, the health officers or veterinary officials? It would seem as though, if the work were not in charge of veterinary officials, it should at least be a co-operation between the medical health officers and the veterinarians, as from an economic standpoint the veterinarians are more interested than health officers. But from the standpoint of the communication of diseases from animal to man, the health officers are more interested. At least, the two professions should work together in obtaining uniform laws for controlling disease, particularly tuberculosis.

*Report of the Bureau of Animal Industry, 1908, pp. 183-96.

W. L. BEEBE.

Minnesota Live Stock Sanitary Board.

SOME RECENT PROGRESS IN SEWAGE DISPOSAL.

During the last decade the progress in sewage purification has been so marked that many works, in order to be up-to-date, will require remodeling, and textbooks rewriting and enlarging. The most important part of purification works which has quite recently been improved is the sludge disposal, which has been a bothersome subject in many places for over thirty years. It was thought about 15 years ago that the introduction of the septic tank would solve the existing difficulties, and it was heralded to completely and satisfactorily dispose of the sludge question. For several years the new method spread because it was cheap, was a change from the older objectionable methods and was at least a pretense of doing something new to correct one of the most troublesome evils met with when sewage had to be purified on land.

The septic tank wave passed from England, where it originated, to our country, and here gradually from the East to our Far West. But two years ago, in California, I was met with the remark: "Of course you will recommend us to build a septic tank." Last summer two of the most prominent English sewerage engineers said to me that if their respective cities had not erected large septic tanks, they would not now for a moment think of using them.

The reasons for this change of opinion can be summed up as follows:

1. The great reduction in the amount of sludge to be handled as promised by the advocates of the septic tanks has not been realized. The failure was partly due to the fact that where the combined system of sewerage was used, large quantities of mineral and of resistant organic matter, washed from the streets by the rain, naturally found their way into the tank. Of course no septic action could reduce such matter, and this part of the sludge could not be diminished. It was also due to the fact that in some cases the anaerobic action decreased near the bottom of the mass collected in the tank by the development of toxines, which made the liquefaction very slow. At Birmingham, England the reduction of the sludge by septic action amounted to only about 12 per cent.

2. It was gradually realized that the reduction of the mass of sludge to be handled was largely a question of water content. As an example: If we have sludge in a septic tank containing 95 per cent. of water and then place that same sludge upon a field where its water content would be reduced by drainage to 50 per cent., then ten tons of sludge in the former condition would be but one ton in the latter condition, or a reduction in quantity to be handled of 90 per cent. By reducing the water content merely from 95 per cent. to 90 per cent., we reduce the bulk of the sludge 50 per cent., or one-half. Therefore, a reduction of bulk by drainage is very much greater than a reduction by septic action, the latter referring only to solid matter.

3. The odor about a septic tank is frequently offensive, although sometimes it is confined to a small area and soon lost at a distance. The odor is quite objectionable in most cases. Covering the tanks is, as ordinarily proposed, an expensive proceeding and is not necessary for septic action.

4. It was found that the septic effluent was less fit for subsequent oxidation of the sewage by biological filters (Germany) or bacteria beds (England) than fresh settled sewage, and its discharge into running streams was not as satisfactory on account of the aquatic life contained therein.

5. The sludge which has to be removed from septic tanks is often foul when taken out and its removal is connected with more or less of a nuisance.

6. There has recently been introduced another method of sludge treatment which obviates all of the above objections to the septic tank. It is known as the Emscher tank, because it originated and has been extensively used in the Emscher Valley of Germany, containing many large manufacturing cities, such as Essen, etc. This tank bids fair to supersede the older septic tank. It was suggested and developed by Dr. Imhoff.

The Emscher tank consists of a double-deck basin, through the upper compartment of which the fresh sewage flows at a velocity sufficiently slow to allow of a deposition of nearly all of the suspended matter that will putrefy; therefore, within a few hours and before septic action becomes established. The particles of matter slide down the inclined bottom to a slot through which they enter the lower tank and where they remain. The sewage

therefore leaves the upper tank free from all coarse suspended matter, and in most cases is sufficiently fresh to need no further treatment if discharged into a natural course of sufficient flow. In the lower tank the sludge accumulates and remains submerged for several months, during which time it digests or rots, so that after a certain time the putrescent matter has disappeared. The sludge has then changed from an odorous, sticky and slimy condition to a non-odorous, earthy and friable condition.

The gas which evolves in the lower tank escapes at the surface at designated points. The action of decomposition is shown at the surface by more or less active ebullition, and is an index of the rate of decomposition. The gas is chiefly carbureted hydrogen, or marsh gas and has no odor. In rising to the surface the bubbles bring with them particles of sludge which form a scum, but the area at these points of escape is very small, amounting to but a few square feet. The rising bubbles bring no suspended matter into the upper tank and thus none is mixed again with the fresh sewage passing through it, as the position of the slot prevents an entrance.

The withdrawal of the sludge from the bottom of the lower tank, which also has an inclined floor, is accomplished through the water pressure in the upper tank, forcing the sludge to within a few feet of the water level in a pipe from which it can be discharged when desired. This discharge should be brought about at frequent intervals once or twice a week, but only as much should be withdrawn at one time as is completely rotted out. This frequent motion, caused by the withdrawals, displaces the sludge mass while it slips downward to the outlet to fill the space from which some of it has been withdrawn. By this displacement each time the toxines are scattered and new surfaces are brought together which assist in maintaining a continuous bacterial action. A further slipping of the mass is accomplished by the discharge of water from pipes, laid upon the bottom of the tank, whenever it is found necessary.

The sludge when withdrawn is conducted to a bed suitably prepared by underdrainage and spreads out upon the same in a layer. Its water content when issuing is from 80 to 90 per cent. Due to the disappearance of much organic matter the amount of water held is less, other things equal, than in fresh sludge. After

three or four days of dry weather the Emscher sludge has lost so much of its water that it can be spaded and is then thrown upon trucks which remove it to a final dump. The liquid draining from this sludge in the beds is generally perfectly clear, has no odor and can be discharged into any water course.

There are now several dozen of these tanks in operation in Germany and at no place examined by the writer was the sludge found to be offensive or could not be used for making land. Nowhere was an odor of sulphureted hydrogen apparent, although such odor might be produced were the sewage not fresh on delivery or under some other conditions not yet definitely known.

It has been feared, unless fresh sewage were continually brought and mixed with the settled sludge, that the putrefaction or rotting out would diminish and finally cease. The practical results have so far not justified such fears in the cases visited, where an effort was made to give occasional motion to the sewage within the lower tank.

An experiment with this method has recently been made in the city of Philadelphia lasting for about one year, with the same favorable results that were reached in Germany.

There is still an unsettled question which awaits an answer, regarding the very best means of accelerating the bacterial action in the lower compartment of the Emscher tank. Experiments are now being made in this direction. It has seemed that it might be an advantage to cultivate a particular class of bacteria, namely, that class which produces carbureted hydrogen, than to allow of a great variety of classes to be present and active, as they generally are in ordinary sewage. The class which produces sulphureted hydrogen should, if possible, be prevented from developing, and in practice this seems to have been accomplished at a number of plants. The best conditions permanently to secure an inoffensive sludge digestion will, it is therefore hoped, be ascertained at no distant date.

In a few European cities, particularly in Frankfort o. M. a method of sludge drying has recently been developed by the use of centrifuges. In these cases the sludge is fresh and therefore still contains all of its putrefying matter. The drying of fresh sludge is more difficult than that of the digested sludge of the

Emscher tanks. As a matter of fact, it is not as dry, when it leaves the centrifuge, as the Emscher sludge after a few days draining, and there is a further difference in that the former retains its strong foul odor and the latter has none. It must not be overlooked that the cost is also a factor to be considered, but reliable comparative results have not yet been published. It cannot be questioned, however, that a sludge turned out upon the ground which is not foul, is worth a greater expenditure than one that is foul.

From what has been said above it seems that the most troublesome feature of sewage purification on land and perhaps also in our rivers, has at last been found capable of some correction at a reasonable cost, and had been developed to a point where a nuisance can be avoided.

In most cases it should not be difficult to build our sewers with regular and smooth interior surfaces, so that the flow is complete, without forming pools, eddies or other irregularities which invite deposits and subsequent putrefaction. It should not be difficult to allow large quantities of air to circulate in the sewers and to furnish the oxygen necessary to facilitate ample oxidation. Then the sewage could reach the disposal ground without offensive odor unless the distance is very great. It will also be possible to deposit its suspended matter in a suitable tank and pass on, still in a fresh condition, either into a water course or be discharged upon coarse-grained filters for final oxidation.

It will not be possible to reach this desirable end in every city, but it will be possible to reach it in most cities, and when the advantage is fully recognized of maintaining sewage in a fresh condition, from the point of its generation to the point of its disposal, no doubt many improvements can be made towards securing this end in many of our cities. It would certainly mark an important step of progress in this branch of engineering.

The oxidation of sewage by coarse-grained or biological filters has recently been making great progress, both in Europe and America. It has been found that sewage must be freed as much as practicable from suspended matter if the biological filters are to do their work most economically.

Prior to turning the sewage upon these filters it is now often the endeavor to give it a very thorough preparation. Settling

tanks or septic tanks were not found to completely avoid the passage of some fine suspended matter to the sprinkling filters, and it has been tried to improve the condition by introducing, between such tanks and the filters, some fine screening or scrubbing, or of allowing a passage through a small roughing filter by which the finer particles of suspended matter are retained and do not reach the filter. These provisions mean, of course, additional labor and structures, but it appears that the expense is often reimbursed by greater efficiency. At Birmingham, England, the introduction of roughing filters has reduced the stoppages in the sprinkling nozzles to such an extent that one man is now doing the work on the beds that formerly required four men.

The opinion is growing that bacterial action is not the chief agent in the purification of sewage. Larger organisms are credited with doing a large amount of the work. But the mechanical theory of purification which claims the purification to be almost entirely due to physical as against vital forces is also making some progress. It has for its chief advocates Dr. Travis in England and Stadtbaurat Bredtschneider in Berlin.

The truth seems to lie in the direction of giving credit to all three causes. It remains merely to point out the proportion of the whole purification which each one effects, which has not yet been satisfactorily done.

It must further not be overlooked that a good deal of the solid matter issuing from filters is organic matter that has been formed and grown within them, representing organisms which have performed their work and have died. All organic bodies, including ourselves, are formed of material that was first in solution and has been transformed into solids by organic processes. This may explain the fact that from some filters more suspended matter has issued than has been discharged upon them. The theory of de-solution advocated by Dr. Travis finds its verification, it would seem, partly by the formation and growth of organisms within the filters.

Regarding the presence of bacteria in sewage, from the moment of its origin to that of its final disposition, the opinions are crystallizing around the conviction that we must discriminate between two kinds of bacteria: Those which are pathogenic and apt to

produce diseases in higher organisms, and those which are essential in effecting sewage purification by mineralizing the organic matter.

While on the one hand, therefore, we must do everything in our power to destroy the former, on the other we must be equally solicitous to foster the development of the latter, until their usefulness has ended and they themselves will perish. Consequently it is a radical mistake to endeavor to destroy or remove the bacteria in a water which is not yet free from dead organic matter which might still become objectionable. It would equally be a mistake not to endeavor to destroy the dangerous pathogenic bacteria.

It has begun to look irrational to remove a certain percentage say 99 per cent. of the bacteria, leaving 1000 where there were 100,000 or one when there were 100, instead of leaving a definite maximum number, such as 100 per c. c., as was proposed by Koch, to indicate that the water was sufficiently pure to starve out entirely the low life which it contained.

The recent success in destroying the least resistant pathogenic bacteria by small doses of hypochlorites added to the water supply, has opened up a promising field in the effort to destroy one class and still make use of the other.

Practically, we have already begun to act along this line, first by utilizing the bacterial life naturally present in polluted waters or sewage, for the destruction of the relative large quantities of organic matter contained therein, and finally, when only very small quantities of organic matter are left, by applying artificially, a destroyer for the less hardy pathogenic bacteria, should any have survived the previous ordeal. Not only is economy served hereby but there is also a better assurance given that all the malefactors have been removed.

In conclusion it may be said that while the progress in sewage disposal has been rapid and satisfactory in a number of directions and while we are now endeavoring to provide for an oxidation of the liquid matter and a preliminary treatment of the separated suspended matter, it remains yet to work out some of the details of both processes, so as to get the best effects at the least cost.

RUDOLPH HERING.

New York City.

SPECIAL ARTICLES

THE HYGIENE OF THE SWIMMING POOL.*

By JOHN W. M. BUNKER, A. M.,
Brown University.

Of late years the general use of swimming pools has brought up a new problem in sanitation, the problem of the hygiene of the swimming pool. It has been suggested that the swimming pool may be a source of danger as well as one of benefit to the user. To remove such possible danger has been the purpose of the experiments here described. All work was done on the pool at Brown University.

This pool is seventy-five by twenty-five feet, three and one-half feet deep at one end and eight at the other, giving a total capacity of approximately seventy-five thousand gallons. The pool is emptied, cleaned, and filled from the city mains once in three months. The water is kept at a temperature of 68° F. The cost of the water necessitates the using of the pool water over and over. Therefore, at the opening of the pool in 1903, there was installed a gravity sand filter which proved inefficient, clogging repeatedly.

In 1908 a new filter was installed similar to the one at Amherst College, designed and built by the Norwood Engineering Co. This plant combines a settling basin and sand filter of six feet in depth, grading from 2 inch crushed rock to fine sand.

The water from the pool is at present drawn off at the rate of 125 gallons per minute, and pumped into the sedimenting tank, where once a week three pints of alum are added as a coagulant. The course of a particle of water through this tank is about twenty feet, due to the arrangement of baffle-beams. The outflow is spread through a butterfly valve over the surface of the sand filter, whence it goes down through and into the pool. Under this system an amount of water nearly equivalent to the content of the pool is passed through the filter each day, the pump being

*Read before the American Association for the Advancement of Science, Boston, Dec. 27, 1909.

run from 9 A. M. to 6 P. M. This method of filtration keeps the water in the pool clear and of good color but has little effect on bacterial content, although the efficiency of the filter is good.

Samples taken from the surface of the pool three feet above the inlet, after a period of fifteen hours' quiet, show counts of from 300 to 400 bacteria per cc. when grown on agar at 37°. At the same time samples from the deep end of the pool showed counts of from 400 to 500. Samples from the deep end when it is stirred up by those using it, show a content of from 500 to 1000. These analyses show that under this system of filtration, purification is incomplete.

Under such conditions there must ever be danger of transmission of disease. In the time that the pool has been in use at Brown it is true that there have been no epidemics of disease that could be even remotely connected with the use of the swimming pool. Cases of nose and ear affections have occurred occasionally among members of the swimming team which may or may not have been due to infection in the pool. Others have traced cases of this sort directly to swimming pool infection.* Meagre as are the statistics of disease contracted in this way, the danger of infection from a pool used by many, in which the bacterial content is not frequently destroyed or greatly reduced by some adequate means, is surely very real. The colon organism is known to flourish for long periods in water, and its sister organism *B. typhosus* has the same tendency. One can never tell when a carrier case will infect such a pool, and the warm water would offer an inviting habitat for the sojourn of the germs.

The swimming pool, then, must ever be a menace unless preventive measures can be applied to overcome this danger. Inasmuch as filtration as usually employed yields only partial purification, the alternative seems to be disinfection. Disinfection by heat is out of the question because of the expense. Disinfection by chemicals would be applicable could one be found which would be unobjectionable to those using the pool. Different chemicals have been tried out at the Massachusetts Institute of Technology in the case of sewage, and as a result of these experiments the practical application of chlorine as a disinfectant has been made in the case of the sewage and drinking

*Carolus M. Cobb, M. D., Boston Med. & Surg. Jour., July 2, 1908.

water. We have endeavored to apply these results to the water of the swimming pool.

Two-litre samples of swimming pool water were treated with hyperchlorite of lime in the ratio of one part of available chlorine to 1,000,000 of water. The original bacterial content of 700 per cc. was reduced to 0 in fifteen minutes. The same experiments were repeated using one-half the amount of lime. Of six samples of treated water taken fifteen minutes after the addition of the chemical, two each had 1 colony per cc., and the others were sterile. All samples were incubated at 37° for twenty-four hours.

The result of these experiments seemed to warrant the trying of the same experiment on the pool, and it was accordingly treated with hyperchlorite of lime in the strength of 1 part available chlorine in 2,000,000. No odor was noticeable in or out of the water nor was there any perceptible taste. The lime was finely pulverized, placed in a cheese-cloth bag and dragged about the pool until distributed. Surface samples before disinfection yielded a count of 500 per cc. Three samples after 15 minutes yielded a count of 30 per cc. After thirty minutes the count was 10. After one hour there was complete sterility. A sample eight hours later, when the pool was still in motion from those who had entered it, showed a content of 5 per cc. The pool remained practically sterile for four days, whereupon the count began to steadily rise. A second experiment yielded practically the same curve of purification.

From these results it would seem that the application of hyperchlorite of lime offers at once a cheap, efficient, and convenient method of insuring a hygenic swimming pool.

THE SPREAD OF SCARLET FEVER AND DIPHTHERIA IN SCHOOLS.

By CHARLES V. CHAPIN,
Superintendent of Health, Providence, R. I.

The public, and most health officers, are inclined to consider the intercourse of children in schools as a common cause of the spread of these diseases. This view is encouraged by the fact that during the summer time, when the schools are not in session, there are usually much fewer cases than at other seasons of the year. English statistics published, year after year, particularly those of London, show that there is a decrease in the prevalence of scarlet fever and diphtheria during the summer vacation, which in England is only for four weeks in August, and that this is followed by an increase when schools open. It also appears that the seasonal variations are more marked in children of school age than in those younger and older. Kerr,* the Medical Officer of Education of London, has given this subject much careful study, and his conclusions are not in accord with popular notions. In 1907 he† had shown that a considerable part of the reduction in reported cases was due to the absence from London during the holidays of many children of school age. Thus the absence from London represented about 18 per cent. of the holiday period, which accounted for the larger part of the 29 per cent. reduction in scarlet fever and diphtheria. A more intensive inquiry, made in Battersea (London), in 1909, showed that many light cases are not seen by a physician, and are missed entirely during the holidays, but are, during school time, discovered by the "attendance officer" who visits the houses of the children to discover the cause of absences. These two causes, the absence of children from the city, and the "missing" of cases, seem to account for most of the apparent decrease in reported cases which occurs in the holidays. The increase in cases after the opening of school was shown not to be the result of school

* Rep. of Med. Officer (Education), London, 1909, 63.
† Rep. of Med. Officer (Education), London, 1907, 31.

attendance. Thus the reported cases of diphtheria at school age in the first week of school was for all London 27, and for the second week 99. But these 99 cases were carefully investigated, and it was found that in 69 there had been no case of diphtheria in the school within one month. In fifteen instances there had been a case in the school within one month, but none in the same class (room?), and no connection could be traced, and in some instances infection out of school was discovered. Two cases, sisters, in one school proved to be the cause of subsequent cases, and three other cases in one school were due to carriers. Thus the assumed excess of 52 cases due to school infection, an increase of practically 100 per cent. was shown by detailed study to be really ten per cent. The three cases in one chool were due to carriers, and Kerr suggests that a part of the increase in scarlet fever and diphtheria in the autumn may be due to the cumulative effect of "missed" cases occurring during the holidays, may of which cases, he shows, would have been discovered by the attendance officer if the schools had been in session.

Kerr has also shown that the diseases under consideration spread chiefly by contact infection, which is the view now generally held by health officials, and that the conditions for this contact infection are far less favorable in school than out. Twenty-six scarlet fever cases which had been attending school were only discovered when desquamating. Only two cases developed from these 26. The danger to be apprehended from infection of the schoolroom itself is practically nothing, and the routine disinfection "of unoffending tables, chairs and floors" is deprecated. In the twenty-six instances of scarlet fever cases in school mentioned above, disinfection was performed only twice, on request of the sanitary authority, and it happened that one of the two secondary cases was after disinfection.

A tabulation was made of the reported cases of scarlet fever and diphtheria in Providence among school children for the five years ending in 1908.* This showed that scarlet fever exhibited a marked decrease in each year BEFORE the summer vacation, and that diphtheria decreased in three of the five years. In half the instances the autumnal increase in these diseases began BEFORE the schools opened, and in one other instance the increase of scarlet fever

*Rep. of Supt. of Health, Providence, 1908, 20.

was delayed until a month after the opening of schools. As the beginning and the ending of the summer drop in these two diseases is thus shown to be independent of school sessions, there is no reason for assuming that the decrease is at all dependent on the closure of schools. A study of the curves indicates that the decrease of scarlet fever and diphtheria in the summer time is correlated with the temperature, but not through the schools.

A similar study of the seasonal distribution of ALL cases of these two diseases for the ten years ending in 1903 shows that the beginning and ending of the summer decline has no apparent causal connection with school attendance, as it usually precedes instead of follows the opening and closing of the schools. The relation is no more marked when school children alone are studied than when all cases are considered.*

The period of incubation of scarlet fever and diphtheria is so short that if school attendance has any influence on the spread of these diseases it is not impossible that the short vacation of a week to ten days may have a noticeable effect. Indeed it is frequently alleged that such an effect is easily seen. But in Providence there was a decrease of these diseases 21 times in the week following the short vacation, an increase 20 times, and the number of cases remained the same 8 times. The study of school children alone, 1904–8, showed a decrease after the vacation 9 times, an increase 13 times and the same number of cases 4 times.

For the purpose of studying the incidence of these diseases in schools in Providence sets of cards are kept, one set for scarlet fever and one set for diphtheria, with a card for each school. On these cards is noted every case of the disease which develops in a pupil attending the school, and also every case of the disease which develops in the family though not in the person of a pupil. By this means any excess of the disease in a school is at once noted. In Brighton, England,† a large chart is kept in the health office on which is noted against each school the cases of contagious disease therein occurring.

By these means it is found that outbreaks do occur in which cases of scarlet fever and diphtheria develop from contact in school, or perhaps more often during recess, or while the children are

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* Rep. of Supt. of Health, Providence, 1903, 112.

† Rep. of Med. Officer of Health, 1910, 10.

coming or going. That a certain number of cases are reported among the pupils of a school does not necessarily prove that they have any relation to school attendance. An investigation of the cases shows that often they are, either certainly or probably, due to neighborhood rather than school contact. Yet school outbreaks do occur. During the past 26 years there have apparently been in Providence twenty such outbreaks of diphtheria and eight of scarlet fever.

Another reason for doubting that school attendance greatly influences the prevalence of scarlet fever and diphtheria is that these diseases are more common in children under school age than they are among those of school age. The following table shows the age distribution of the reported cases of scarlet fever and diphtheria in Providence for twenty-one years:

	Diphtheria. 1889–1909	Scarlet Fever. 1889–1909
Under 1 year	197	264
" 1 year	491	528
" 2 years	738	891
" 3 "	795	1097
" 4 "	813	1090
" 5 "	764	1171
" 6 "	775	1141
" 7 "	665	1027
" 8 "	565	868
" 9 "	463	713
" 10 "	371	577
" 11 "	333	418
" 12 "	285	362
" 13 "	200	245
" 14 "	147	227
" 15 "	119	149
" 16 "	105	128
" 17 "	94	121
" 18 "	79	74
" 19 "	67	69
" 20 "	79	58
Adults	1219	640
	9364	11858

It will be observed that the amount of disease increases until the first year of school attendance when it begins to fall off. It is remarkable if school attendance has sufficient influence to cause the autumnal increase in these diseases as is so often alleged, that it has not sufficient influence to at least keep up the disease after children reach the age when they begin to go to school.

While it appears to be true that the diseases under consideration rarely spread in schools, and that the schools are safer than the streets, yet a certain small amount of infection probably does at times take place in school. This of course should be guarded against by taking every reasonable precaution. It is probable that the rules in regard to the school attendance of children from families where these diseases exist, are in most of our cities, amply sufficient to prevent extension from reported cases. Indeed these rules are probably often unnecessarily stringent. Disinfection of the school is, generally speaking, a useless procedure. The trouble comes not from the recognized cases but from the "missed cases" and healthy "carriers." How to discover these, and what to do with them, is an unsolved problem. It is true that the medical inspection of schools has resulted in the discovery of some cases that would otherwise have been missed, and that it is probable that the increasing interest of the teachers will discover more of them. But the carriers, and indeed some mild cases, are likely never to be discovered. To prevent harm from such, it is necessary to reduce to a minimum the chances for the exchange of saliva and other secretions. The common drinking cup must go. The use of the slate encourages carelessness with the saliva. Each child should have its own pencil and they should not be exchanged. The roller towel is almost as bad as the common drinking cup. The teacher must teach personal cleanliness by precept and example. If she licks her fingers to turn over papers, or moistens her pencil on her lips, she is teaching the children to exchange saliva and innoculate themselves with diphtheria bacilli. The use of modeling clay and sand, and much other kindergarten work, encourages personal uncleanliness and suggests that human secretions are in no way harmful. If, however, the child is taught to wash its hands, and wipe them on its own towel, before touching the clay, and to keep the fingers out of the mouth while modeling he will learn that it is wrong to inflict his own saliva on another. By such teaching the spread of contagious diseases in school may be made even less than it is.

WATER-ANALYSIS AND THE PUBLIC HEALTH.*

By DR. D. G. REVELL,
Provincial Bacteriologist, Edmonton, Alberta.

(EDITOR'S NOTE.—Every public hygienist is probably called upon more or less frequently to explain to members of the laity just what a sanitary water analysis means and under what conditions the results obtained are of value. The above paper, written for a lay audience, presents these facts so clearly and concisely that the Editors of this Journal present the paper in full.)

As the population of a community becomes denser, so-called public utilities become increasingly more vital to the well-being of the citizens, and I believe that among these utilities I may safely give the water-supply first place in importance. No other one thing is so great a factor in public health, and the greatest resource of any nation is the health of its people. This it is that conditions the enjoyment of the other resources of the country and the status of a nation among the powers of the world. When malaria invaded Greece and depleted the health and vigor of the people of that wonderful nation to which modern civilization owes so much, her power rapidly waned and disappeared. Before the health of the inhabitants of the Panama canal zone was made secure by the adoption of intelligent sanitary measures which practically abolished yellow fever, typhoid and malaria, the work of construction of the canal was carried on under such difficulty owing to sickness and death that success was impossible.

Among the great resources of the Province of Alberta the health of her people must be reckoned as first. The conservation of this basic resource of her people is fundamtenal to the full development and realization of all her other resources. In this work of conservation the Union of Alberta Municipalities can and will play a large part.

At the outset of what I have to say it may be well to define the two chief terms in the title of this paper. By "water-analysis" is here meant the examination of water by laboratory tests to ascertain certain data which aid in forming an opinion as to the sanitary quality of the water, that is, its fitness for domestic purposes.

* Read before the Union of Alberta Municipalities, Wetaskiwin, Alberta, Sept. 7, 1910.

"Public health" is perhaps most easily defined as the object of public hygiene which in turn can not be better defined than in the words of Sedgwick.*

"Public hygiene is the science and the art of the conservation and promotion of the public health. It has for its function the prevention of premature death and the promotion of normal life, health and happiness in communities, chiefly by the elimination or amelioration of unfavorable environmental conditions common to many persons or communities either at one time or at different times. It includes especially hygienic problems common to groups or communities, such as camps, villages, towns and cities, e. g., water supplies, drainage, milk supplies, ice supplies, the control of infectious diseases, heating, lighting, ventilation, school sanitation, municipal sanitation and the like."

The laboratory tests above referred to comprise physical, chemical, microscopical and bacterial examinations. In addition to these the thorough study of a water includes the medical question of its biological effects and such engineering questions as the available quantity, head, feasibility for use as compared with other possible supplies, etc. This comprehensive study of water-supplies may be termed "water-investigation," and is most effectively carried on by the co-operation of bacteriologist, chemist, physician and engineer.

A mention of some other kinds of analysis of water will serve to make clearer by contrast what sanitary analysis is. Thus there is mineralogical analysis of water to determine exactly the mineral substances which are dissolved in it, and which may have medicinal or commercial value; also boiler-analysis to decide as to the suitabliity of a water for boiler use; commercial analysis of water intended for industrial purposes such as dyeing, brewing, etc. It is a serious but common mistake to look upon sanitary water-analysis as similar to these others, or like the assay of an ore, and to expect it to be carried out under the same conditions as are appropriate for these.

Says a well known authority† on water analysis:

"A great deal of popular misconception exists upon the subject of the analysis of potable water, and it is commonly supposed

* "Principles of Sanitary Science and the Public Health," by W. T. Sedgwick, McMillan Co., New York.

† W. P. Mason, page 1, "Examination of Water," Jno. Wiley & Sons,

that such an examination may be looked upon from practically the same point of view as the analysis of an iron ore. That this belief is founded on fallacy may, however, be readily shown. When an iron ore is submitted for analysis the chemist determines and reports upon the percentages of iron, phosphorus, sulphur, etc., found therein; and at that point his duties cease, inasmuch as the ironmaster is ordinarily capable of interpreting the analysis for himself. Even should the analyst be called upon for an opinion as to the quality of the ore, the well known properties of the several constituents make such a task an easy one, and assuming the sample to have been fairly selected, the opinion may be written without any inquiry as to the nature of the local surroundings of the spot whence the ore was taken."

All natural waters are pure water plus chemical substances and living organisms, dissolved or suspended in the water. Ordinarily the chief chemical substances in water are:

(1) Gases occurring in nature, such as oxygen, nitrogen, carbon dioxide and ammonia;

(2) Liquids, as for example, organic acids;

(3) Solids, such as lime, magnesia, iron and various organic substances.

The living organisms are:

(1) Bacteria and other small and simple forms of plant life such as algae and diatoms;

(2) Low forms of animal life, so-called animalculae or infusoriae. These and the algae and diatoms are examined for by the use of the microscope.

(3) Higher forms of animal life, (insects, worms, fish) are also found in water but are not ordinarily taken account of in analytical work. Of these various contents of water those of most interest here are:

(a) Chemical substances not in themselves harmful in the minute amount usually present but whose presence is indicative of the possible dangerous bacterial contamination of the water. These are determined by chemical analysis.

(b) Certain kinds of bacteria, either themselves dangerous to health, or probably accompanied by such and hence indicative of contamination. These are determined by bacterial analysis.

As it is the numbers as well as the kinds of bacteria present that guide in judging the character of a water, and as both these features (numbers and kinds) change soon after a sample is bottled, in the thorough study of a water-supply it is necessary to begin the bacterial examination in the field (i. e., in the locality where the water-supply is). A bacteriologist must visit the source, take the samples and "plate" (or plant, make cultures of,) them there. The cultures can then be transported to the laboratory for examination and study.

The bacteria in water may be put in three classes:

(1) Normal water bacteria which are always present and are harmless. Their number varies according to the amount of suitable food for them in the water and differs greatly in the various kinds of water according to source, and even within the same class of water, especially as the season changes.

(2) Harmless aliens, derived from the soil and to be regarded with suspicion as they are likely to be often accompanied by the next class.

(3) Harmful aliens, from sewage or bad soil, i. e., really of animal origin and hence condemning the water absolutely. The alien bacteria tend as a rule to disappear sooner or later from water by so-called "self-purification."

Harmful mineral constituents usually render themselves self-evident by the taste of the water or by their effect on the users of it. If a water disagrees, no amount of analysis will reconcile the users of it to its special effects. It is astonishing how often people ask the analyst to tell them what they already know most unmistakably, namely, that a certain water is good to drink or is not. Analysis is ordinarily necessary and justifiable to ascertain the presence only of concealed dangers. In the great majority of cases the dangerous character of a water is readily evident to the eye. As President Brown of Lehigh University said: "It does not require a chemical examination to decide whether a stream has been polluted by sewage when one can see the sewage flowing into it."

For sanitary analysis a true sample is absolutely necessary, that is, a sample which exactly represents the water as it exists in its source or as consumed. "Chemical analysis" is an extremely delicate process, estimating constituents in parts per million and

expressing these to one or two places of decimals. It therefore shows as minute amounts as one part in 10,000,000. Hence it is absolutely necessary that water samples be properly taken in the first place, in suitable and perfectly clean containers and properly cared for until brought under examination. Some of the substances tested for readily become altered after bottling the water, but these changes can be minimized by adding a small quantity of chloroform to the sample and keeping it cool.* The bacterial content of a water is even more susceptible to alteration than the chemical. A bacterial sample can not be treated with a preservative but must be kept cool by packing in ice. There are always numerous bacteria of several kinds present in even small quantities of the best of natural waters. The number is usually estimated and stated for one cubic centimetre amount (about one-sixteenth of a cubic inch). A water is free from living bacteria only after being sufficiently heated or when it contains germicides or substances which destroy bacteria. The numbers and kinds of bacteria in a water sample are ascertained by culturing, a process analogous to the determination of the numbers and kinds of minute seeds present in a quantity of soil by germinating and growing the seeds into full-sized plants.

The requirements, purpose and limitations of a water-analysis must be kept clearly in view by those making use of it. The analytical findings apply strictly only to the sample and indirectly to its source only in so far as the sample at analysis is truly representative of the latter.

The findings from an analysis of a sample do not apply to the past nor the future state of the source of the sample; and herein is one of the most common popular mistakes in regard to the possibilities in water-analysis, viz., it is commonly thought that an analysis is an easy and certain means of determining whether a given water has been the cause of typhoid fever. That such is not the case, however, readily appears when it is known that typhoid infection of water is usually temporary and the disease does not appear generally for two to four weeks after the person takes the germs into his mouth. A week or two more elapses before the disease can be definitely recognized. Then some

* Directions and outfits for sampling are furnished to proper authorities by the Provincial Laboratory.

further time passes before a sample is taken for examination. Thus a period of seven or eight weeks usually intervenes between the drinking of typhoid infected water and the subjecting of the water to analysis. Meanwhile all trace of the contamination may have disappeared, leaving the water apparently quite innocent. Moreover, if the examination could be made at the right time even the most careful examination may fail to detect typhoid bacilli that are actually present. In the routine bacterial examination of water we try to ascertain the number of colon bacilli present. These are the most abundant kind of bacteria in the colon (or large intestine) of animals, hence they abound in animal excreta and being hardy and rather easy of detection they are utilized as a test for excretal contamination. Typhoid bacilli are not nearly as hardy as colon bacilli, and are also extremely difficult to isolate and identify. Hence we examine usually only for colon bacilli. From their number the possibility and probability of typhoid germs being present is deduced. Even then we must remember that water may be infected by urine alone and colon bacilli then may be absent or present only in such small number as to afford no indication of the true state of the water. The urine of a person who has had typhoid may contain as many as 500,000,000 typhoid bacilli in each cubic centimeter. A single stool or bowel-movement of a typhoid patient may contain 1,000,000,000 (one billion) typhoid germs. Typhoid bacilli often get into the gall-bladder during an attack of this fever. They may persist there for years and be given off by the individual continually or occasionally, although his health may be perfectly good all the while after his recovery from the fever.

According to their source natural waters may be divided into the following kinds:

(1) Aerial: (a) Rain-water, snow and hail.

(2) Surface: (a) Ponds and lakes; (b) Streams and rivers; (c) Ice for domestic use may well be included also here, although its bacterial character, and to a less extent in its chemical, it is more akin to aerial water.

(3) Subterranean: (a) Shallow wells; (b) Deep wells and springs.

The numbers and kinds of bacteria and the kinds and quantities of chemical substances normal to these various classes of

water are different for each sort and even within one class the constituents may vary within considerable limits without actual contamination being present. In order, therefore, to interpret a water-analysis (that is to understand its significance) it is absolutely necessary to have certain data, viz., such a description of the source and environment of the water as will indicate the significance of the amount of each constituent determined in the analysis. A standard author (Mason, quoted above) says about this:

"Thus the numerical results of a water-analysis are not only unintelligible to the general public, but are not always capable of interpretation by a chemist unless he be acquainted with the surroundings of the spot whence the sample was drawn, and be posted as to the analytical methods employed.

"It is very common for water to be sent for analysis, with the request that an opinion be returned as to its suitability for potable uses, while at the same time all information as to its source is not only unfurnished, but is intentionally withheld, with a view of rendering the desired report unprejudiced in character.

"Such action is not only a reflection upon the moral quality of the chemist, but it seriously hampers him in his efforts to formulate an opinion from the analytical results.

"As Nichols has well said, 'It is a great mistake to suppose that the proper way to consult a chemist is to send a sample of water in a sealed vessel with no hint as to its source. On the contrary, the chemist should know as much as possible as to the history and source of the water, and if possible, should take the sample himself.'

"It was years ago laid down as a golden rule 'never to pass judgment upon a water the history of which is not thoroughly known,' and the nearer this maxim is lived up to today the fewer will be the mistakes in the reports issued.

"A water-analysis, on the other hand, is really not an analysis at all, properly so called, but is a series of experiments undertaken with a view to assist the judgment in determining the potability of the supply."

The popular tests by which the quality of a water is judged are its odor, taste and "appearance" (or color and clearness). These tests are utterly unable to distinguish between a safe and an

unsafe water and may condemn a perfectly safe water and accept a very dangerous one. Thus, odors commonly attributed to sewage pollution may be due to either living or decaying algae and diatoms (two classes of water plants) or infusoriae (so-called "animalculae," minute forms of animal life) and an ill-smelling water may be quite harmless and safe to drink.

The general purpose of sanitary water-investigation is to safeguard the public health as dependent on purity of water-supply. The specific purposes of the analyses made in this Province are:

(1) To ascertain the suitability for domestic use of given water-supplies, or

(2) To ascertain if the water is concerned in carrying or causing disease.

(3) To obtain "comparates" for Alberta waters. ("Comparates are analytical findings in water from various sources known to be uncontaminated.) If a doctor were asked what is the matter with a person who weighs 250 lbs. he would, before answering, wish to know the person's height, age, sex, weight in the past, etc. The person might be perfectly well. Just so when we attempt to determine the sanitary quality of water it is necessary to have other analyses and other data besides the analytical figures from the sample under judgment. We must know what is usual (or "normal") for unpolluted waters of the locality and class in question at that season of the year. This is determinable only by numerous examinations, giving what are known as comparates. These are absolutely necessary to the interpretation of a chemical sanitary analysis of water.

A reliable opinion as to the sanitary status of a water-supply can be rightly formed only upon the following data:

(1) The history of the use of the water, especially its effect on health.

(2) The data from intelligent, exact and thorough sanitary and topographical inspection of the environment of the water.

(3) Comparates for the locality, class of water and season in question.

(4) The analysis of proper samples of the water.

Of these four requirements the first two are more necessary than the last two, and are generally more easily and quickly obtainable.

The effects of the use of a given water on health is a biological test and is one of the most crucial tests to which the water can be subjected. It is moreover, a test which has already been made usually before any other test is asked for. In one instance I was asked to examine the well-water of a family in which there were then six cases of typhoid. For months previous to the onset of these cases the well-water was also used by a lot of other persons, none of whom developed typhoid. This was a biological test that exonerated the well at once quite clearly and much more certainly than all the chemical and bacteriological tests could have. Indeed these would have condemned the well for it was just beside the barnyard and the stand or well-cover had openings (for the rods of the double force pump) through which the manure brought there by the farmer's boots was being washed every time water was pumped. It was winter and one could see the manure right there on the ice, being washed down into the well every time water was pumped. Seeing is believing and it required no analysis to prove that that well certainly was both chemically contaminated and also contained plenty of colon bacilli. Yet it played no part in the typhoid outbreak for which it had been blamed. Probably none of the colon bacilli in the well came from human excreta. There is no way of distinguishing between colon bacilli from various animals. A brief study of the cases in this outbreak revealed an unsuspected "walking case" as the originator by contact.

Water-analysis is unfortunately the subject of the grossest misconceptions in the popular mind not only as to the why and the how of undertaking it and as to the application of its findings, but even as to what supplies are proper objects of such attention. Briefly these latter are:

(1) Supplies proposed for public use, or extension of public use, and

(2) Public supplies in use and justly under suspicion of causing disease. A water is justly brought under suspicion by what may be compared to the general examination which a doctor makes of a patient before he ventures any diagnosis. This general study often either gives the water a "clean bill of health" or unmistakably condemns it without recourse to the laboratory tests

which are frequently uncertain in their significance and should follow, not precede, the general study mentioned.

Laboratory examination of public supplies proposed for new use or for extended use has regard to color, odor, taste, turbidity, hardness, (or soap-consuming power), alkalinity, total dissolved solids, chlorine and iron; also free ammonia, albuminoid ammonia, nitrites and nitrates. Of these various chemical contents the iron and the hardness are in themselves directly important and significant. The others are merely suggestive of the possibility of the presence of dangerous bacteria. In addition to the quality of the water as indicated by the analysis there should also be ascertained: (a) The quantity available and whether sufficient for present and future purposes; (b) The environment of the water, both the present actual and the probable future conditions to which the water supply will be exposed; (c) The cost to install, maintain and operate the necessary works to handle the water. A careful inspection or topographical survey of the source of the water should never be omitted and should put contamination out of the question as a possibility, or at least as a probability, before the water-supply is adopted, unless no other is available and means to purify it are incorporated into the waterworks system.

There is a great deal of popular error as to the possibilities in water-analysis. I think the chief reasons for the mistake are:

(1) In many instances of typhoid epidemics, sensational results have been got by thorough investigations of the water-supplies at fault—the public have regarded these investigations as consisting merely in analysis of the water, although the analysis of the water may in many instances have quite failed to prove the water at fault. In other words, the general public, and even many medical men, have confounded water-analysis and water-investigation. The latter includes the former and much more.

(2) Water-analysis proper has been confused by the laity with other analyses which are absolute in their findings and do not require interpretation.

(3) Water contamination is usually temporary but the uninformed think analysis of a sample shows all the past history of its source.

Two somewhat common and very serious mistakes are, first, to regard water as always to blame for typhoid and, second, to

rely solely on water-analysis to discover the part played by water in typhoid outbreaks. Typhoid infection always comes to its victim more or less directly from another human being. The germs are carried by various agencies of which the most common are water, milk, flies and fingers. But water can not originate the germs of typhoid, neither can milk nor even the much-blamed but usually innocent "unsanitary conditions," broken sewers, etc. Perhaps the most common way in which typhoid is communicated in Alberta is by contact, i. e., close association with a person either sick with typhoid fever or still harboring the germs after an attack. It has been discovered in recent years that of every hundred persons who recover from typhoid some four continue to give off typhoid germs in their excreta for years afterwards. These are termed "typhoid-carriers," and they may cause mysterious outbreaks of typhoid by infecting water, milk or food. Such persons are especially apt to cause outbreaks of typhoid if employed as cooks or as dairy-workers. The infection may be carried by flies from exposed contents of privies used by such persons. The lesson from this is to regard all human excreta —both urine and faeces—as dangerous. In every community there is almost certain to be one or more typhoid-carriers, and as early as possible every municipality should establish a public waterworks system and a sewerage system and enforce their use by all householders, thus abolishing the death-dealing privy and private family well.

As regards the mistake of relying too much on water-analysis to discover the cause of typhoid I shall only point out that in the investigation of typhoid outbreaks the question to be answered is not merely "Is the water to blame?" but "What are the sources and channels of the typhoid infection in this instance?" This question can be answered only by a competent investigation by a trained and experienced man, an epidemiologist, (one who investigates epidemics). In the course of such investigation it may be found advisable to have water-analysis, but this should neither begin nor end the enquiry.

Water analyses are often asked for in connection with suspected conveyance of disease by drinking the water. In these instances if there is any real reason for suspecting the water, the result of analysis should, of course, not be waited for before apply-

ing measures to render the water safe. Not to analyse but to sterilize is the first requisite in dealing with suspected water. This may now be rather easily, quickly and simply done by the hypochlorite treatment. The full investigation of the water may then be proceeded with deliberately and with the comforting assurance that any danger in the water has been eliminated.

To sum up briefly the points I wish to emphasize:

(1) Pure (i. e., safe) water-supplies are a first requisite for the public health.

(2) In the selection and protection of public water-supplies, comprehensive water-investigations are necessary.

(3) Water-analysis is an essential part of water-investigation.

(4) To have any real value water-analysis must be carried out with exactness and rigid care. Proper samples are absolutely necessary.

(5) The results of every analysis must be "interpreted" before they are understood or are of practical value.

(6) The interpretation can be made only when we have comparates and full data regarding the source of the sample.

(7) Such comparates and data are obtainable only by systematic work, carefully planned and carried on over a long period.

(8) Unity and economy of such work can not be secured if it is left to haphazard local events. It can be successfully carried on only by a Provincial organization with the necessary machinery and authority for such investigative work.

FUNCTIONS OF A PUBLIC HEALTH LABORATORY.*

By D. G. REVELL, B. A., M. B.,
Provincial Bacteriologist, Edmonton, Alberta.

Preventive medicine occupies an increasingly important and large place in the history of modern medicine. In this growth and development laboratory investigation has played a large part. The present is seeing an extension of its methods and their application. The future will see this continue until not only diagnosis but also the application and results of treatment will be subject and subjected to laboratory control. Laboratories are of various kinds. That properly termed a public health laboratory is of a special kind and in order that it may serve its maximum of usefulness there must be a clear understanding of its relationship, requirements and limitations and this understanding must be shared alike by those who originate and maintain it, those who conduct it and those whom it serves. Otherwise there must result cross-purposes, misunderstandings and dissatisfaction. In what I have to say to you today my endeavor is not so much to add anything new to ideas regarding the functions of a public health laboratory as to emphasize certain phases of the relationship of its work to the work of the daily practitioner. I shall first enumerate the chief functions of such a laboratory, then briefly discuss these separately, necessarily without any attempt at an exhaustive consideration. And in the beginning let me confess that I shall take liberties with the title of my paper and digress frequently beyond what may seem the strict boundaries.

FUNCTIONS. Broadly speaking the functions of a public health laboratory are concerned with health matters of public interest, i. e., with public utilities related to health and with diseases that menace the public. By public is here meant more particularly the well or healthy people. Note that it is "public health," not "public sick people's laboratory." Specifically these matters of public interest are, first, infectious diseases; second,

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* Read at Provincial Medical Association at Calgary, Alberta, Aug. 19, 1909.

public supplies of water, milk and food; third, sewage disposal; fourth, the production of vaccine, antitoxic sera and antirabic treatment; fifth, education of the public re public health and disease; sixth, research in the preceding fields. In regard to infectious diseases the function of the laboratory is (1) to discover foci (or "seed-centers") of infection of the naturally communicable diseases of man and (2) to discover if possible the channels and agents by which the infection is spreading in any given outbreak. The endeavor to discover foci is made by the laboratory examination of material from suspected cases. This endeavor is necessarily limited to those diseases furnishing material in which infection can be recognized and for which there are practicable laboratory methods. The chief of these are pulmonary tuberculosis, diphtheria, and typhoid fever, in man, also tuberculosis, glanders, rabies and anthrax in domestic animals. To these might be added malaria, syphilis, gonorrhea, (including ophthalmic), smallpox and other contagious diseases in which laboratory findings may aid in diagnosing.

The exact significance of the laborarory report should be always kept clearly in mind. The ultimate purpose of the examination is the protection of the well people who might be exposed and it is chiefly to this end that it aids in the curative treatment of the sick person. Thus, if everybody had pulmonary tuberculosis we would not make public examinations of sputum for the presence of bacillus of tuberculosis. To illustrate and make this more evident and also to bring out some other points I shall discuss in some detail the purpose of the work of the laboratory on some of the diseases enumerated above and more espccially the significance of positive and of negative reports. Sputum from a case of suspected pulmonary tuberculosis is examined to find an answer to the question "Is this sputum dangerous to the public health?" and a positive report on the presence of tubercle bacilli in sputum means: "This sputum is infectious and should be dealt with accordingly." The neglect to apply proper preventive measures in the case of a patient whose sputum is reported positive for tuberculosis is, therefore, the failure to realize the essential purpose of the laboratory. To state it another way: Sputum is examined for tubercle bacilli not merely to answer the question, "Has the person whose sputum this is, tuberculosis?" and a

negative report on sputum merely means "This sputum is not found to contain tubercle bacilli." It emphatically does not mean and never should be taken to mean that the person has not tuberculosis, even tuberculosis of the lungs.

Sputum examination may have quite another application which by contrast serves to emphasize its real bearing in public health work. Thus it may be made with reference to a life-insurance risk. I think you will agree that this is not a matter of public health. In order that a positive finding may be had for a given sample of sputum the following conditions must be fulfilled: (1) The person must have tuberculosis of the lungs; (2) The disease must have progressed to the extent of breaking-down of tissue; (3) There must be sloughing off into the air-passages of this tuberculous material; (4) Such material must be present in the given sample of sputum; (5) The fragment selected from the sample must contain some of this material; (6) It must be successfully stained; (7) Brought into the field of the microscope; and (8) recognized by the observer. Failure of any one of these requirements results in a negative report which, therefore, should always be interpreted by the Scotch verdict "not proven" rather than "not guilty." Of the above eight conditions to a positive report I think lack of the third or of the fourth is most commonly the origin of a negative finding, i. e., either sloughing off of tuberculous tissue is not occurring or the sample of sputum submitted is not properly derived. It is, therefore, not surprising if occasionally a patient succumbs to pulmonary tuberculosis some time after a negative report has been made on his sputum. This, I think, should hardly be regarded as reflecting on the thoroughness of the laboratory examination. Certainly so far as the sputum examination may be regarded as a means of early diagnosis and a negative report consequently result in neglect of the various means to an actual early diagnosis and of appropriate curative treatment, the sputum examination would well be abandoned altogether for the good of the individual case. Its purpose is not to indicate extraordinary therapeutic measures, but rather that extraordinary precautions should be taken to prevent spread of tuberculosis by the patient and especially that he should adopt proper habits of coughing, sputum disposal, eating, drinking, etc. Of course all sputum should always be regarded as dangerous and

promiscuous public spitting therefore rigidly prohibited and punished by law.

A negative report has a greater value in diphtheria than in either pulmonary tuberculosis or typhoid; in other words, it is easier to exclude diphtheria by bacteriological examination than either of the other two diseases. The diphtheria bacilli are commonly so abundant in the patients' throat and so readily obtained and brought under examination that one is much less likely to miss them than tubercle bacilli in sputum, while the Widal reaction is not constantly present throughout typhoid.

In diphtheria a positive report means: "The liberty of the person from whom this specimen comes is a menace to the public health, therefore, institute or maintain quarantine and other protective measures." Commonly it is taken as signifying that the person has clinical diphtheria and should receive antitoxin. It should be distinctly understood, however, that the clinical diagnosis and the proper curative measures are duties of the attending physician. Laboratory findings are only a part of the evidence on which to base a verdict—sometimes such findings are final and conclusive as to the nature of the disease but never as to the nature of the patient.

Just here I may digress for a moment to make clear an essential difference between the general duties of the private practitioner (family physician) and of the public hygienist or medical health officer. The prime duty of the attending physician is to his patient—*curare tute, cito et jucunde* (to cure safely, quickly and pleasantly). He must "treat the patient and not the disease." The prime duty of the medical health officer is to the public. His essential duty is "treat the disease and not the patient." He must see that the patient is cured safely to the public—and this may not always be pleasantly to the patient—perhaps not even most safely to the patient. Now the patient and his family are a very real and definite quantity—a quantity often of impatience and active resentment towards the measures necessary to the public health. The public is an indefinite quantity often indifferent and ungrateful for the health- and life-saving work of the medical health officer. Only sickness makes us prize health. Here we probably have a large part if not the whole of the explanation of the almost universal unpopularity of the efficient and conscientious health officer.

The investigation of public utilities as bearing on health and disease includes: (a) Epidemiological investigations of outbreaks of disease, especially typhoid; (b) Examination of public water supplies, milk and other foods. Epidemiological investigation should be carried on by a laboratory-trained man, and preliminary to the application of laboratory tests there should always be a thorough study of the entire outbreak, comparable to the clinical study of a case. Thus the investigation of an epidemic should comprise a full anamnesis of the community's health, an accurate study of the present clinical picture of the community and only thirdly and according to the indications of the preceding should laboratory tests be instituted. This order of procedure would not only obviate many useless water-analyses and other analyses, but would give the desired results, would be much more likely to discover the source of the evil and so allow intelligent action to stop or remove it. To endeavor to detect the source of a typhoid infection by resorting immediately to a water-analysis is exactly analogous to an effort to make a diagnosis of any illness by a delicate and exhaustive analysis of the urine as the first step, while entirely ignoring the clinical study of the patient. Both analyses have their value, but their place is certainly not initial. I speak now more particularly with regard to typhoid fever. The source of infection of sporadic or single cases is usually too obscure and such cases too numerous and scattered in this Province to be thoroughly investigated in every instance by a single worker but the first appearance of any sign of an outbreak should at once call for expert study of the situation. I would regard as a sign of an outbreak the occurrence of an associated case. I do not mean, however, that the investigation of single cases should be neglected, I only mean that under present conditions it is not possible to undertake this but it should be aimed at for the future.

The history of each case of typhoid in an outbreak is comparable to a single symptom in an individual case-history. The study of many associated cases is necessary to a proper diagnosis just as the study of the whole symptom-complex is necessary to the exact diagnosis of an individual case of any disease. Seldom is any one symptom pathognomonic, so also a single case-history of typhoid is rarely a key to the source and mode of an epidemic. Correlation of case-histories is here the great essential.

It is possible by keeping close tab on certain data regarding each typhoid case in a community to detect an outbreak very early in its course and even to form a good idea as to the real source of it. Thus milk-, water-, fly-, and contact- or finger-epidemics have each their characteristic features which are rather easily discovered. Such investigative work is as fascinating as criminal detective work—and far more valuable and necessary to the public weal.

The epidemiologist must be an expert, a specialist, if you please, in "community diseases." The local medical health officer has neither time nor usually the necessary special training for successfully doing such work and moreover, in such investigations he is apt to be handicapped by local conditions such as the unwillingness of his fellow-practitioners to give the necessary full insight into their cases. I say this without underrating the high ability and purpose of medical health officers, but we all have our limitations and it is as bad to exceed these as not to work up to them.

Food-analyses for public health purposes are made to determine fitness for human use without endangering health and are desirable for foods that are readily subject to contamination or to sophistication, or as occasion indicates, for disease, unfitness of raw material, use of improper preservatives, etc., as is especially exemplified by milk. In the examination of milk-samples it is possible to determine only certain things, however, viz., the presence and amount of "dirt," the number and kinds of bacteria which are significant as regards local disease of the udder, care of the milk and other diseases of the cow, such as tuberculosis; leucocytes and pus-cells; sophistication such as skimming, watering, and the addition of preservatives; also the amount of butter-fat. This latter is the one thing that is most commonly determined and given attention to. Its bearing is almost purely commercial. As to the "dirt" content of milk we seldom if ever hear a word. If it were generally known, however, that the major part of dirt in milk is manure there would quickly be a more intelligent public demand and sanction for the measures necessary to give us right milk-supplies.

I wish to emphasize that intelligent, thorough and frequent inspection is the only safeguard to a good public milk supply.

The terror of the mysterious bacteriological analysis may be a good thing to hold over the heads of unscrupulous and careless producers and dealers but it should never be expected to take the place of regular inspection.

Certain data regarding each specimen are requisite to realize the full usefulness of the public health laboratory. These data should ensure a thorough clinical study of the case, they form valuable statistical material (in so far as they are accurate), and they serve to bring the laboratory work into correlation with that of the administrative health officer. The laboratory man is a technician. The health officer is essentially an administrator. These two sides of public health service should be clearly distinguished and their workings always be co-ordinated if the maximum of efficiency is to be obtained. This matter of data regarding material may be made clear by a brief reference to venereal diseases. In the bacteriological diagnosis of gonorrhoea and syphilis the public laboratory should, I believe, make free examinations only when the proper data are furnished, including name (or initials) and address of patient, whether married or single, relation to other cases, etc., and when the case if positive, is reported to the medical health officer. If the examination bears only on the treatment of the case, it is a private matter and the patient should pay accordingly. The necessity of proper data is not always rightly understood. If it were there would seldom or never be any hesitation or unwillingness to furnish the information usually asked for.

Water-investigations are a most important function of a public health organization, and are likewise the subject of perhaps the grossest misconceptions not only as to the why and the how of the undertaking and the application of its findings, but even as to what supplies are proper objects of attention. Briefly these latter are (1) Supplies proposed for public use, or extension of use, and (2) Public supplies in use and justly under suspicion. As water is justly brought under suspicion by what I have compared to the anamnesis and clinical picture of a patient, these often either give the water a clean bill of health or unmistakably condemn it without recourse to laboratory tests which are often uncertain in their significance and should follow, not precede, the general study mentioned.

I have been criticized in a friendly way with over-estimating the value and significance of laboratory work and findings. Let me assure you I realize perhaps more keenly than most non-laboratory men how narrow the limitations of laboratory determinations are, and frequently I have to disappoint enthusiasts who ask things that the laboratory does not attempt, either because they are not in the legitimate routine of its work or because laboratory methods have not yet been worked out for them.

To isolate typhoid germs from water is a bacteriological stunt which has seldom been successfully accomplished and is not attempted in routine water work. The colon bacillus is taken as an index to excremental contamination but it is not peculiar to the human intestine and nearly all waters contain it in certain numbers. The number of colon bacilli in a given sample is significant only by relation to that for the comparate for the same class of water.

A COMPARISON OF THE GERMICIDAL VALUE OF A FEW "COMMERCIAL" COAL-TAR DISINFECTANTS.

By FRANCIS H. SLACK, M. D.,*
Bacteriologist, Kansas State Agricultural College,
and
E. MARION WADE, B. A.,
Assistant Director, Boston Board of Health Laboratory.

In connection with the work of any progressive bacteriological laboratory is apt to be heard many requests for testing the efficiency of some of the countless horde of commercial disinfectants, real or so called. These requests are usually instigated directly by the promoters of these compounds, are frequently accompanied with offers of remuneration and are for the purpose of obtaining the name of the bacteriologist or of the laboratory for advertising purposes. The agent usually produces a flood of literature endorsing his particular disinfectant and showing results of favorable tests made by bacteriologists elsewhere, anywhere. In large cities the headquarters of various departments are often literally besieged by such agents, lured on by hopes of large sales and great profits, and the weight of a favorable report from responsible local experts is of course of great advantage to them.

It has long been the policy of the Boston Health Department not to waste valuable time on these countless proprietary compounds and the rule has been adopted that no bacteriological analyses would be made unless the disinfectants had been favorably reported on by reliable workers. In the Spring of 1910, however, at the request of another department comparative tests were made of a number of the more common coal tar disinfectants then on the Boston market.

There is, unfortunately, no standard method of testing disinfectants, one uses the "Drop" method, another the "glass rod" method, another the "silk thread" method, and still others invent new methods of their own. Then, too, the different organisms used vary tremendously in their powers of resistance and

* Formerly, Director Boston Board of Health Laboratory.

indeed this is also true of different strains of the same organism. So that with various combinations of good or poor methods used with organisms of high or low resistance it is possible to obtain unreliable results.

It is high time that the question of standard methods for testing disinfectants should be taken up by some representative association of bacteriologists,* that not only a standard procedure be adopted but also a standard organism chosen and kept to a given power of resistance as measured against for instance a one per cent solution of carbolic acid, then all such tests may be made on a fair basis of comparison.

It is the purpose of this paper to show not only the results of comparative tests as to the efficiency of the various disinfectants tested, but also to compare two methods of testing, viz., the "Glass rod" and the "Drop" methods. Two organisms were used, one a virulent typhoid, recently isolated, the other *Staphylococcus pyogenes aureus*, also recently isolated from a throat culture, the aureus being the more resistant of the two.

Technique of the "Glass rod" method (Hill): Sterile glass rods attached to rubber or cork stoppers are prepared in quantity and placed in test tubes. A twenty-four hour slant culture of the organism to be used is rubbed up carefully with several c. c. of sterile water. The sterile glass rods are then inoculated on the lower ends with a thin film of this liquid suspension and dried for one hour in a special box arranged with a series of holes into which the stoppers fit and which has a cheese cloth covering at one end to admit air and glass opposite to admit diffuse light.

In making the tests the rods are immersed in the desired dilution of the disinfectant for varying periods of time, after which the disinfectant is rinsed off in a tube of sterile bouillon, and the organisms which have been exposed to the action of the disinfectant are now tested by inoculating on an agar slant and this slant together with the bouillon used for rinsing placed in the incubator at 37 C. and examined daily for growth for ten days.

Technique of the "Drop" method: With this method twenty-four hour bouillon cultures of the organisms are used. The diluted disinfectants are measured out accurately in five

*[Ed. Note—A committee on Standard Methods for the Testing of Disinfectants has been appointed by the Laboratory Section of the American Public Health Association.]

c. c. lots in sterile test-tubes and each five c. c. of diluted disinfectant receives an inoculation of 1-10 c. c. from the bouillon culture of the organism with which the test is made, disinfectant and culture being thoroughly mixed by shaking. At designated intervals, 2½, 5, 7½, 10 minutes, etc., subcultures are made from the inoculated disinfectant to 5 c. c. of sterile broth, carrying over one four millimeter loopful. These sub-cultures are incubated at 37 C. for forty-eight hours when observations are made and results recorded.

All the tests in these experiments were made with 1% dilutions of the various disinfectants and a 1% carbolic acid* was run for comparison.

"Drop" method—x stands for growth, – for no growth.

"Rod" method—‡ stands for growth, o for no growth.

T. for *B. typhosus.*

S. for *Staphylococcus pyogenes aureus.*

With the exception of carbolic acid which is placed first in the table the disinfectants are designated by number only.

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* The 1% Carbolic Acid solution was made from commercial crystals by dilution, as with the other disinfectants, it being our wish to approximate as closely as possible the normal, every day use of carbolic as a disinfectant.

	1 Carbolic		2		3		4		5		6		7		8		9		10		11		12	
Time	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.	T.	S.
15″			–	–			x				x				x		x		–		x			
30″			‡				–				–				x		x				–			
45″			‡												x		x							
1′				‡					x								–						x	
2′				‡			‡		–										‡				–	
2½′	x	x	‡	‡	x	x	‡	x	‡	x		x	x	x	x	x	‡	x	‡		‡	x	‡	x
3½′				‡	x							x							‡					
5′	x	x	‡	‡	x	x	o	x	‡	x		x	x	x	x	x	‡	x			‡	x	o	x
6′	–											x												
7½′		x	‡	‡	x	x		x		x	‡	x	x	x		x		x			‡	x		x
10′		x	‡	‡	x	x		x	o	x	‡	x	x	x	x	x	o	x	‡		o	x		
12½′	‡		o	‡	x	x				x	‡		x	x	x	x		x						
15′	‡	x		o	x	x		x		x	o	x	x	x	x	x		x	‡			–		
20′	‡	x			x	x		x		x		x	x	x	x	x		x	‡			‡		x
25′	o	x			x	x		x		x		x	x	x	x	x		x	o	x		‡		
30′		x			x	x		x		x		x	–	x	x	x		x		x		‡		x
32′		x																						
34′		–																						
35′		‡			x	x		x		x		x	‡	x	x	x		x		x				x
40′		‡			x	x						x		x	x	x		x		x		‡		x
44′		‡																						
45′		o			x	x						x		x	x	x		x		x		o		
50′					x	x						x	‡	x	x	x		x		x				x
60′					x	x						x	‡	x	x	x		x		x				x
65′					x	x		x		x		x		x	x	x		x		–				x
70′					x			x		x		x	‡	x	x	x		x		‡				
80′					x			–		x		x	‡	x	x	x		x		‡				
90′					x	x		‡		x		x	†	x	–	x	–	‡		‡				x
100′					x							–		x	‡	x		o		‡				x
2 hr.					–	x		‡		x		‡	‡	x	‡	x				‡				x
2½ hr.					‡	x		o		x		‡	o	x	o	x				‡				x
3 hr.					o	x				x		o		x		x				‡				x
3¼ hr.										x										‡				
3½ hr.										–										‡				x
4 hr.						x				‡				x		x				‡				x
4½ hr.						x				‡				x		x				‡				–
5 hr.						x				‡				x		x				‡				‡
5½ hr.						x				‡				x		x				‡				‡
6 hr.						x				‡				x		x				o				‡
6½ hr.						x				o				x		x								‡
7 hr.						x								x		x								o
22 hr.						x								x		x								
23 hr.						x								–		x								
24 hr.				x		x								‡		x								
26 hr.						x								‡		x								
28 hr.						x										x								
30 hr.						x								‡		x								
32 hr.						‡										x								
34 hr.						o								‡		x								
36 hr.						x										x								
38 hr.						x								‡		x								
40 hr.						x								o		–								
42 hr.						x										‡								
44 hr.						–										‡								
46 hr.																o								
48 hr.																								

The results are more graphically shown in the following table:

Disinfectant	Drop Method Time Required to Kill		Rod Method Time Required to Kill	
	Typhoid	Sta. P. A.	Typhoid	Sta. P. A.
Carbolic acid	6′	34′	25½′	45′
2	15″	15″	12½′	15′
3	2 hr.	44 hr.	3 hr.	34 hr.
4	30″	80′	5′	2½ hr.
5	2′	3½ hr.	10′	6½ hr.
6	30″	100′	15′	3 hr.
7	30′	23 hr.	2½ hr.	40 hr.
8	90′	40 hr.	2½ hr.	46 hr.
9	1′	90′	10′	100′
10	15″	65′	25′	6 hr.
11	30″	15′	10′	45′
12	2′	4½ hr.	5′	7 hr.

If we may be permitted to say that we arrive at a fair idea of the relative value of these disinfectants by adding together the time results of these tests then No. 2 stands first with a 28′ record. No. 11 next with 70′ 30″, Carbolic third with 1 hr. and 50′ and then following in the order named, Nos. 9, 4, 6, 10, 5, 12, 7, 3, and 8.

It will be seen that with but one exception a longer time, usually a much longer time, is required to kill the organisms with the rod method; which may be explained by saying that with this method we test not only the killing power but also the penetrating power of the disinfectant. With the drop method the individual organisms are surrounded with the disinfectant which is thus enabled to work at its greatest efficiency.

As disinfectants are used, practically, we seldom obtain such conditions as are represented by the drop method of testing, thus No. 10 seems quite superior to No. 9 as tested by the drop method but No. 9 has superior penetrating power as shown by the rod method. No. 9 would then be the better of the two for practical uses.

Many of these proprietary compounds claim efficiency far superior to carbolic acid, yet in this series of tests which we think is fairly representative, but two proved superior.

As a class they possess advantages over carbolic for cleaning purposes and as deodorants and are easier to handle. As a rule

they are much more costly. As commercial products of unknown composition we cannot be sure, except for those guaranteed by reliable manufacturers that even different samples of the same name will have equal efficiency.

In the opinion of the writers carbolic acid still holds first rank as a reliable, cheap, effective disinfectant and is to be preferred, unless for some special reason as noted above, to any of the commercial products of unknown composition.

A NEW FORM OF ANAEROBIC JAR.

By S. HENRY AYERS,
Bacteriologist, Dairy Division, U. S. Department of Agriculture.

Laboratory workers engaged in investigations on anaerobic bacteria may be interested in a new metal anaerobic jar, designed by the author, which has been used successfully in the Research Laboratories of the Dairy Division for the past year.

The complete jar is made of spun copper and consists of two parts, the jar and cover, as may be seen in the drawing.

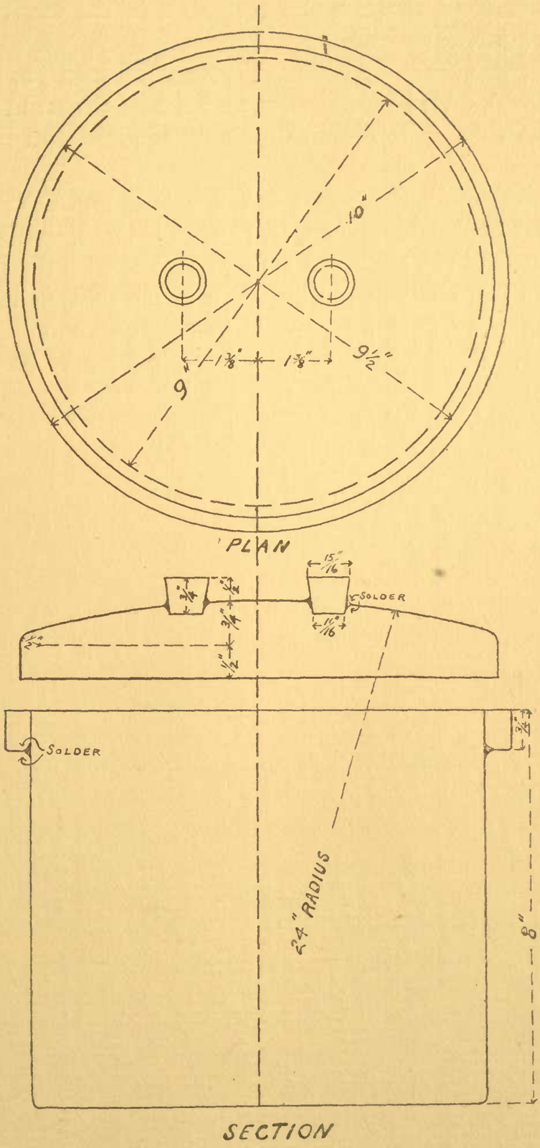
The jar is 9 in. in diameter and 8 in. high and is made of one piece of 16 oz. copper spun in the form shown in order to avoid the possibility of leaks which might occur had the bottom been soldered on. Around the top of the jar is a flange of copper ½ in. wide and ¾ in. deep. This is attached to jar by soldering both inside and outside of the flange to make a thoroughly tight joint.

The cover is 9½ in. in diameter and also made of spun copper. In the top are placed two nipples of copper each being soldered on both sides of the cover.

In using the complete jar, rubber corks should be fitted tightly through the nipples and sealed in with paraffin. Through the corks, glass stop-cocks are inserted.

When using the apparatus a crystallizing dish is placed in the bottom of the jar and covered with a perforated copper plate which forms a base on which to rest cultures. Pyrogallic acid is placed in the crystallizer and sodium hydrate added. Melted paraffin (melting point of about 60° C.) is then poured into the flange around the top of the jar and the cover with the stop-cocks closed is placed over the top so that the edges rest in the melted paraffin. The paraffin solidifies quickly and makes a tight seal which will hold indefinitely.

To open the jar it is simply necessary to open one of the glass stop-cocks to admit air, then run a flame from a bunsen burner around the flange so as to soften the paraffin. The cover may


10"
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SECTION

then be removed easily. The sodium hydrate or hydrogen gas may be admitted through the stop-cock in the usual way after closing the jar, if desired.

The jar was made by Miller & Doing, of Brooklyn, N. Y., at a cost of $18.50. While that seems a high cost, it should be remembered that the jar is practically indestructible and has a large capacity.

It is possible for those who do not care to go to the expense of having a jar made of spun copper, to use a tin pail. A flange may be soldered around the top and a tin cover made with the two nipples soldered in it. Care should be taken to see that all the soldered joints are tight. Such a jar would be very cheap and serviceable.

The advantages of the metal anaerobic jar may be mentioned as follows:

1. Ease of operation.
2. Assurance of a tight jar.
3. Indestructibility if spun copper is used.
4. Large capacity.
5. Cheapness, if made from tin pail.

American Public Health Association

SOCIAL ECONOMICS AND PUBLIC HEALTH.*

Address by Mayor SEIDEL,
Milwaukee, Wisconsin.

"The building of a perfect body crowned by a perfect brain is at once the greatest earthly problem and the grandest hope of the race." This quotation from Dio Lewis, the noted American reformer and physician, could well stand as the motto of the American Public Health Association.

As I welcomed this, the Thirty-eighth Annual Meeting, I could not but feel that our city harbored not only one of the most noteworthy conventions, but also a convention, the moral force of which is more far-reaching than many years of prayer and preaching. Nor do I wish to be taken as being extravagant in my statements. It did not appear to me that within the reach of my voice there was present any one that came here to seek his or her own personal health. You were gathered to discuss and deliberate over the questions that pertain to the Public Health.

Who and what is this Public? Your neighbor, my neighbor. Our citizen and our fellowmen, of which thousands are strangers to each one known to us. The question: "Am I my brother's keeper," is no longer entirely an idle one.

The phrase "Public Health" is not so very old. There was a time when the health of the individual was of greater concern than the health of the public. Indeed such a phrase as "public health" was entirely unknown. How strange the following quotation sounds to us: "People who are always taking care of their health are misers, who are hoarding up a treasure which they have never spirit enough to enjoy." Yet such was the warning of Sterne, an American lawyer and contributor to reform literature.

That was the spirit of individualism. It concerned itself with the individualist alone. Today the health of the public is rapidly taking the foremost rank in the attention of men who make health a study at all. That day of individualism is on the decline.

*Read before the American Public Health Association at Milwaukee, Sept., 1910.

Great changes have come over the modern world. Where formerly production was carried on by the individual, today a great number of individuals are necessary to produce a given article. This has led to the rise of new questions, more difficult problems.

Throwing together a great number of men into one occupation led to a feeling of common suffering, common pleasure, common weeping.

Individualism placed its stamp on every institution of man, however noble its inception might pretend to be, not even excluding religion. This individualism is responsible for the spirit that breathes in such utterance as "The public be damned."

Industrial development wrought great changes. Common suffering prompted collective efforts at salvation. Not salvation to certain individuals but to each, through all. Right here it might be injected that the much maligned Labor Unions are only one expression of this new force. And they are the natural products of industrial dependence; the force or government or man is yet to be born that can destroy the spirit which with dynamic force drives the toilers together.

Even today by many the private health, or personal health of one man, woman or child is not thought of as having any connection with the vast mass of other men, women or children, except in times when epidemics or plague sweep over a community. How many in a community understand that the causes that lead to the sickness of the neighbor's child must effect their children also.

While on the one hand, this work that you are doing here for your communities can be termed as being prompted by a great moral feeling of responsibility that each one feels for the welfare of his neighbor; on the other hand, each of us only acts in the interest of self-protection.

If my brother is tubercular, syphilitic, possessed of a rank, communicable disease, then it is strictly my personal business to be my brother's keeper to the extent of watching that he cannot pass it on to me. This is one of the reasons that public sanitation, public hygiene, and social economics are commanding the attention of all earnest men and women.

Social economy is the science that concerns itself with the feeding, clothing and housing of a people or race. Given an

industrial people, its tool and implements, its intelligence and its natural resources as factors, the problem is: "In what relation to each other must these factors be placed to secure to each human individual the greatest amount of happiness commensurate with the welfare of all?"

To even the most superficial observer of conditions these facts must stand out prominently, viz.: We know that a sufficient supply of wholesome and pure food is necessary to keep a body strong and healthy; yet we permit the supply of our food to be made the object of speculation and monopoly; we allow it to be adulterated; we leave the choice and preparation to ignorance and only too frequently have not even learned to eat it properly.

We know that our lungs need an abundance of fresh, clean air; yet we live in congested city districts; our streets are littered with dirt of all kinds; we neglect our backyards and let them become fruitful hearths for the spread of disease; we neglect the grasses that act as sponges that will hold and return to the soil waste; trees and shrubs which act as shields against the chilly blasts of wind are used only to a limited extent in the building of our cities. Our men and women work in shops that very often are reeking with filth and in which only too frequently our foods are prepared; we permit the foundry cupolas and factory smoke-stacks to eject poisonous gases and soot into the atmosphere that we breathe. Sunlight which we recognize as a vital force in all life, we have shut out from our streets by means of skyscrapers. And we are not yet ready to call a halt upon the "*insanity of speculation*" in construction of office buildings. Each owner of a small lot claims license to build as high as he chooses without regard to sunlight or air.

Land speculation is responsible for miserable and frequently criminal platting. Prices of land are prohibitive and will not permit a family with moderate means to buy more than to place a few square feet of shelter upon it. And the less fortunate worker cannot even claim it.

Planning of homes is done only too often by inexperienced men, and then it so happens that the rooms that are most used can very often never be reached by the benevolent rays of the sun. Plumbing is faulty because of poor inspection or ignorance. Ventilation is entirely overlooked. If the builder is careless or

ignorant, then this only too often is true in a much greater measure of the housekeeper. Bedding which should regularly be aired in the sun, never receives an airing, though not always is the housekeeper to blame.

The high cost of clothing favors the making and marketing of shoddy garments. Improper care and improper choice of clothes, scant amount, because of high prices, accentuate the evil. Darning and mending have almost become a lost art. As a result, clothing, not at all suited to the season is worn and must be worn lest there be none at all to wear.

Men and women as well as children spend six days and more each week, ten hours and more each day in the shops where dust and fumes are breathed and no sunlight enters. The hazards are increased by death-dealing machines.

Schoolboards and Boards of Education are not free from blame. How many of your schoolgrounds are ample? How many of your schoolgrounds are provided with trees, shrubs and grass? The cat and the dog instinctively avoid a visit to your schoolgrounds, but your boy and girl are helpless. The truant that plays hooky and finds a swimming hole in a brook often displays better judgment than the learned professor.

Let me ask any practitioner whether or not the above depicted conditions have any bearing upon the success of his work. Why do these conditions exist? We are not ignorant of them. We know that they are injurious to our health. We know that they are not conducive to the growth of a strong race. And yet we tolerate them. WHY?

Because by means of their existence, we are enabled to pay higher dividends when the fiscal year of a corporation closes. IT IS ALL FOR PROFITS.

It is with these problems that Social Economy deals. It is these that the administration in Milwaukee proposes to take up one by one and solve as near as it can with the limited powers that are at its disposal.

Without the solution of these problems, many of the tasks that you will desire to take up, must prove insoluble. This is the relation of Public Health to Social Economics: To be strong and healthy, a people must have pure, wholesome, nourishing food and a sufficient supply of it. Furthermore, a people must have clean

and pure air. They must also have proper clothing and sanitary housing. They must also receive a liberal education to enable them to intelligently care for their needs.

All of these functions become the affair of all concerned. None of these functions must be left to the selfish propensity and greed of individuals or corporations. If the collective intelligence of man has enabled society to produce a sufficient amount of goods with which to supply its wants, by no law of justice or equity, should these goods be the property of any one man, or corporation to be used by him or it to exact tribute from those who have made those goods, and failing to get that tribute, starve them.

It is as wrong for one man to be the master of many in the field of industry as it is for one man to be the master of many in the field of politics.

We have stripped the monarch and nobleman of his power over his subjects. Like Americans true to the trust placed in us by Washington, Lincoln, and other great Americans who have fought, bled and died for our institutions, we must strip the trust magnate and the industrial pirate of his power over our fellow citizen.

Permit me to emphasize the fact that you gentlemen who are assembled here constitute in fact the greatest conservation congress ever gathered in America.

Land has a value. Timber has a value, and so have water power and mineral deposits. These, with machinery, are important factors in wealth production. But the most important factor of all in wealth production is human labor. Without labor of hand and labor of brain applied to raw material, there is no civilization thinkable. The greatest of all natural resources is human life with its accompaniment of labor.

It is good and excellent work to conserve land and timber and water utilities. But it is far more excellent, far more important, and far more fundamental, to conserve human life and make it more efficient and give it added ability and power to create.

The very organization of this association sprang in part from the widespread and clearly apparent waste of human life through what we now call "preventable disease." One of the best signs of the times in which we live is the coining of this phrase "preventable disease" and the increasing number of people who

recognize the portentious, noble and splendid meanings that are back of this phrase.

That our eyes must witness such fearful, stark, pitiful waste of human life through diseases that are preventable, cannot be called otherwise than a great social tragedy. But that you gentlemen have recognized that tragedy exists and that you gather to combat it, that you gather to advise with each other and use all your associated resources to fight back this tragedy and make way for a more healthy, efficient humanity, this is the brighter side of the situation.

Upon the memory of the days of my childhood, I draw for a picture. A prophet was taken by the hand and carried out and set down in the midst of a valley covered with dry bones. The prophet passed through amongst them. He observed that there were many of them strewn in the valley and there was no life to them. A voice asked: "Can these bones live?" The reply he gave was: "O, Lord, God, thou knowest." Again the voice spoke, commanding, "Prophesy," and as the prophet spoke, there was a noise and a shaking and the bones came together and sinews and flesh came upon them and skin covered them, and there was a wind and breath came over them and they lived.

When confronted with actual conditions, you may find yourself in a similar position that the prophet Ezekiel found himself in, but you must raise your voice and you must prophesy and you must teach and you must command, and soon there will be a noise, and a shaking, and men will come together and new ideas will form and new ideals will take possession of the masses and once more, they will begin to live.

THE INTERNATIONAL HYGIENE EXHIBITION, DRESDEN, 1911.

AN APPEAL.

From May to October, 1911, there will be held in Dresden, an exhibition to be known as the International Hygiene Exhibition. The scope and purpose of this exhibition are clearly set forth in the following letter presented to the American Public Health Association at its meeting in Milwaukee. The United States Government has been officially, through proper channels, invited to participate in this exhibition but up to the present time the invitation has not been accepted because of the absence of any appropriation from which the cost of representation can be defrayed. So far as is known no state government has thus far undertaken to send an exhibit. Sanitary organizations of the United States that will participate might probably be numbered on the fingers of one hand. In view of this most deplorable condition, the American Public Health Association, at its Milwaukee meeting, authorized the appointment of a committee to do whatever might be possible to bring about proper representation from the United States, that committee having been instructed to co-operate with the organization committee of the International Congress on Hygiene and Demography, which is to meet in the United States in 1912, and which, therefore, has a direct interest in seeing that the United States is properly represented at Dresden. The appointment of the committee to look after this work is, however, not sufficient, but every member of the organization should do his part to interest the United States government, through his senators and representatives in Congress, to interest his state government, and to interest any national sanitary organizations with which he may be affiliated, in preparing immediately suitable sanitary exhibits and in applying for such space as may be necessary for their accommodation. The committee named by the Association is as follows:

Prof. Henry Albert, Iowa City, Iowa; Dr. Henry G. Beyer, Washington, D. C.; Dr. E. A. Carr, Lincoln, Neb.; Dr. C. E. Ford,

Cleveland, Ohio; Dr. Allen W. Freeman, Richmond, Va.; Mr. Rudolph Hering, New York, N. Y.; Dr. Heber Jones, Memphis, Tenn.; Dr. Jos. S. Neff, Philadelphia, Pa.; Dr. M. L. Price, Baltimore, Md.; Dr. W. F. Snow, Sacramento, Cal.; Dr. Gardner T. Swarts, Providence, R. I.; Dr. Wm. Bailey, Louisville, Ky.; Dr. H. M. Bracken, St. Paul, Minn.; Prof. H. W. Conn, Middletown, Conn.; Dr. W. A. Evans, Chicago, Ill.; Dr. C. A. Harper, Madison, Wis.; Dr. John N. Hurty, Indianapolis, Ind.; Dr. Richard H. Lewis, Raleigh, N. C.; Dr. Eugene H. Porter, Albany, N. Y.; Dr. Mark Richardson, Boston, Mass.; Dr. F. W. Shumway, Lansing, Mich.

Dr. Henry G. Beyer, Medical Director, United States Navy, has been requested to see to the organization of this committee, and any further information that may be desired concerning the Exhibition, can be obtained by writing directly to him or by writing to the Secretary of the Association. Members of the Association are earnestly requested to read Dr. Beyer's letter to the Association, printed below.

WM. C. WOODWARD, Secretary.

To the President and Members of the American Public Health Association:

GENTLEMEN:—You will by this time probably all be aware of the fact that the great Exhibition of Hygiene in Dresden, 1911, is practically an accomplished fact, its success assured. While it would be superflous on my part to attempt to speak of the organization of this Exhibition, its progress and purposes, you will all admit that it is eminently fit and proper that a few words on this subject should be said at this meeting of the Association. My object in addressing you on this occasion is that of arousing your sympathetic interest in this great event.

We all realize that the prosperity of a country, the orderly progress of a nation, the maintenance of national wealth as well as health, the struggle against disease and quackery, the whole subject of the higher medical education, are all intimately connected with our efforts of raising the standard of knowledge among our people in matters concerning the public health, and Exhibitions are the acknowledged most powerful means for the diffusion of such knowledge.

The time has passed when any particular individual or concern, whether scientific or industrial, should be allowed to impose their wares upon the public by adorning them with a fictitious value and importance. The American Public Health Association should be in a position of passing upon all public health laws and regulations, before being enacted, and constitute, at the same time, the highest tribunal in the country before which all scientific matters in dispute should be brought for their final decision. We all know that public opinion is the most powerful factor to be influenced by educational means in this country. Towering over President and State Governors, over Congress and State Legislatures, public opinion stands as the source of power for good, when intelligently directed. To educate and direct that power in matters of public health is one of the most beneficent functions of the American Public Health Association.

The public must be made to feel and understand that the American Public Health Association is not a tyrannical medical trust, trying to control public interests for its own good, but an Association of the highest and purest type of scientific men, whose sole aim consists in providing every family in the country with humane and sanitary surroundings, and as having the public welfare in its keeping. The greatest obstacles in the way are private interests. So long as private interests, animated by selfishness and greed, are allowed to pervert public opinion, without educational countercurrents to correct these effects, the needed co-operation on the part of the public cannot be expected to be forthcoming. It needs the intelligent and confidence-inspiring direction of a great body, like the American Public Health Association, in all public instruction. Exhibitions are the most powerful means for the necessary knowledge and the diffusion of the principles of public health among the people.

An entirely new and uncommonly great chapter in the history of International Exhibitions opens to the world with the International Hygiene Exhibition to be held in 1911 at Dresden. In the whole history of Exhibitions, without exception, no chapter, however far reaching and important, has ever stood out with the prominence, equal to that of the Exhibition under discussion. It will indeed mark an important epoch, not alone in the history of practical and scientific sanitation, but also in that of human

culture and civilization. The Exhibition, in fact, is not so much an exhibition as it is an illustrated expression of the twentieth century civilization and culture. As a humanitarian work, the Exhibition, in the altruistic character of the motives that alone could have prompted such an undertaking, typifies the pinnacle of civilized human endeavor. One of the most fundamental features of the Exhibition is represented by the scientific section. It has become recognized that without a scientific section to correlate the different parts of an Exhibition and give each its peculiar meaning, an Exhibition would be merely an amorphous mass of apparently unrelated facts, an accumulation of fragments of knowledge without a life-giving soul. This scientific section, moreover, tends to give a universal significance to the industrial side of the Exhibition. The Exposition is intended to show what science as well as industry has accomplished in the domain of Hygiene, and in doing this it is to teach how best to translate the lessons taught by both into practical life, incidentally showing us new problems and new ways for accomplishing our ideal.

Thus, the latent lessons of scientific hygiene that have accumulated through years of patient study in laboratory work and which have remained buried between the dead covers of books on our library shelves, are at last to be opened up to the world in the form of one tremendous and monumental illustrated textbook, speaking a universal language for everybody to understand and the lessons of which everybody may take home to his own fireside for the mere price of the asking. This most generous undertaking has its origin in the fertile minds of a small group of German scientists, who met at Dresden in 1903. The small local Exhibition on sanitary subjects in that year, which was the object of this gathering, met with a public reception so enthusiastic that the time seemed, to this small circle of men, to be ripe for a similar but larger Exhibition and in which the whole world might be invited to participate and receive its due share of the benefits it conveyed. The conception then and there formed and discussed developed as years went by until at last it has assumed the gigantic proportions, promised and presented to us in the completed and published programs of today.

In planning for this Exhibition, the fundamental idea consistently carried out was this: That the center of gravity of an

Exhibition lies in the domain of ocular demonstration and not in that of considering the scientific problems involved in sanitation, which is the function of congresses. To judge from the list of names of noted hygienists, registered as active participants in this great enterprise, the most noted men in the world seem to have fallen into line, and this active interest is by no means confined to Germany alone, but every country of Europe, Asia, and Africa seems to be creditably represented, so that the success will be a monumental one. Most every city in the German empire has contributed to the financial success of the undertaking, the most loving and beloved of Kings, Friedrich August, of Saxony, being its protector, the German Emperor, himself supporting it, and up to today 2500 scientific men are devoting their time and energy to this cause without apparently receiving any pecuniary returns for their services. The question for us to answer is:

Can the United States Afford to Keep Out of It?

So far as I know, no organized effort has been made in this country up to the present time for participation in this Exhibition. All invitations for united action have fallen by the wayside and even the United States Government has only half heartedly declared its intention to participate. When even so small a country as Bulgaria has appropriated 200,000 marks in order to be represented at this Exhibition, when Japan has appropriated 300,000 marks for the same purpose and intends to send a war ship to Germany with orders to stay during the entire Exhibition, is it right, is it proper, is it even policy for us to keep out of it?

Can we, indeed, as a great nation, afford to decline, accepting an invitation by a friendly government to join friendly nations in an amicable rivalry in such a humanitarian endeavor as this? Is it in keeping with national dignity and can it be done without loss of prestige and of the esteem of the civilized world, or would it be more in keeping with our reputation as a generous nation and in harmony with the public will for us as a Government, and as private citizens as well, to take our place in the procession of nations that belongs to us in one of the greatest humanitarian endeavors ever before undertaken? When this great International Manual on Applied Hygiene will be opened to the world in 1911 at Dresden, in which the great contributions of the world will

stand recorded and, when the representatives of every nation and country will point with pride to their countries' contributions, while the United States can only point to a blank page in the book, would not the face of every American, whether patriotic or not, show the humiliating blush of shame? The impression which such a sin of omission on the part of the United States would create might be disagreeably enduring, especially on the part of those on whose shoulders the responsibility in matters of this character rests. Let us all therefore, as members of this Association wake up to a realization of our share of duty in relation to this matter and organize and set to work. Above all, let us select a leader with the necessary organizing capacity and enough of moral force to overcome the difficulties inseparable from the participation in all International Exhibitions. Let us select a man, who sees in such obstacles and difficulties, his opportunities. As long as we have in this country no such thing as a National Department of Public Health to take the lead in all such matters, the conditions would point directly to the American Public Health Association, upon which the duty of taking the lead in this matter devolves and in keeping with this conception, an appeal to this great Association is herewith publicly recorded. Will it accept the challenge and answer to the charge?

Mr. Emil A. Lingner, the Imperial German Commissioner, a gentleman of the right sort, with an impressive and most agreeable personality, of a confidence-inspiring honesty and frankness, and deeply impressed with the importance of his duty, and who came to this country in order to ascertain what was the real cause of the seeming indifference toward this Exhibition and for which this country had been unduly conspicuous, should not be allowed to have his efforts go unrewarded.

HENRY G. BEYER,
Medical Inspector, U. S. N.,
In Command, U. S. Naval Medical School, Washington, D. C.

September 2, 1910.

The Massachusetts Association of Boards of Health

OCTOBER QUARTERLY MEETING
Boston, Massachusetts

The regular quarterly meeting of the Massachusetts Association of Boards of Health was held at Boston, October 27, 1910, under the Presidency of Dr. Henry P. Walcott.

Upon the recommendation of the Executive Committee the following gentlemen were elected members of the Association:

Ernest B. Dane, of Brookline.

Dr. James J. Scannell, of the Laboratory of the Boston Board of Health.

Dr. Benoni M. Latham of Mansfield.

Dr. P. Challis Bartlett, Superintendent State Sanitorium, Rutland.

Dr. Merrill Edwin Champion, of Arlington.

Dr. Thomas E. Lilly, of the Shirley Board of Health.

Dr. Rufus E. Darrah, Chairman of the Newport, R. I., Board of Health.

Dr. Charles F. Whitney, of the Boston Board of Health.

Dr. Charles E. Harris, of the Barnstable Board of Health.

REPORT OF THE COMMITTEE ON TYPHOID FEVER.

A belief that American sanitary officials are not at present doing nearly as much as they should to prevent the spread of typhoid fever was the motive which lead to the appointment of this committee. Even the departments of health in our largest and best governed cities are far from exercising the control which they could, and in smaller communities, with less means, active preventive measures against the disease are often sadly neglected. The committee therefore feel that it is their duty to urge in the most emphatic way, certain definite measures which the local boards of health ought to recognize as incumbent upon them to carry out. It was even suggested that legislation might be desirable, which would give to the state board of health authority to compel local health officers to carry out the necessary preventive measures. But it is earnestly hoped that the sanitary officials of our cities and towns will awake to a realization of their duties and of the good results which are likely to follow more energetic preventive measures, so that such centralization of sanitary administration will never be considered necessary.

The discussion of this subject at the last meeting related to the extension of typhoid fever by contact infection, or by the direct contamination of food materials by the hands of patients or carriers. The committee have therefore restricted their recommendations to measures intended to prevent this mode of disease extension. The importance of the distribution of typhoid fever by means of sewage pollution of water was not lost sight of, but the work of the Massachusetts state board of health has, at least in this commonwealth, pretty well educated the public to realize the necessity for correct water and sewer engineering. Indeed the larger communities of the commonwealth are well protected against water-borne epidemics. Engineers have been wont to call non-epidemic, non-water-borne typhoid fever, which occurs with even the purest water supply, as "residual typhoid." We now know that this "residual typhoid," which has been too long neglected, is due chiefly to fairly direct modes of contact infection.

It is therefore necessary to bend our energies to the eradication of this type of the disease, and to do so successfully, we must realize that it it as truly a contagious disease as is diphtheria or scarlet fever, though not to the same degree.

The first requisite for a successful campaign against a contagious disease is the prompt report of cases. One reason why physicians fail to report typhoid fever is because they do not see any results. The report is too often merely placed on file. If the case is promptly visited, water, milk and food investigated, and specific directions given as to disinfection and the protection of the rest of the family and the public, physicians will realize that their reports are of some consequence, and have it in mind to make them promptly. Failure and delay in notification, in a large proportion of cases, is due to failure or delay in making a diagnosis. Hence the health department, local where possible, state where the local fails, should provide not only for the Widal test, but what is much more important, for cultures from blood and excreta. Furthermore every facility must be given the physician for sending in the material, and prompt notice of results must be sent to him. The case should then be visited at the earliest moment by an agent of the health office, a medical man or a visiting nurse, or both. The epidemiological history of the case should be obtained, and not general advice given, but specific directions as to disinfection of the excreta and clothing, and as to what must be done by the nurse to avoid infecting herself and carrying the infection to others. The patient should be isolated in much the same way in which diphtheria patients are isolated. The majority of the committee believe that the best way to secure such isolation is to placard the house, both front and rear, the rear placard, usually the one seen by milkmen and grocers, being the most important. In the families of the poor, where there must be great danger of the infection of other members of the family, removal to a hospital is desirable where possible. If any member of the family is a food handler, it must be seen to, that there is no chance for the spread of the disease by this means. Circulars of information may be left with the family but these should never take the place of direct personal instruction.

If typhoid fever cases are to be isolated, a criterion must be established for the termination of isolation. With the inadequate

laboratory facilities now available, it is impracticable at present to require bacteriological tests for all cases. It is believed, however, that such tests should be demanded for handlers of food. For others a good working rule would seem to be to terminate isolation when the temperature of the patient has been normal for two weeks. It has been shown that by this time the large majority of cases no longer excrete the bacilli. It is not believed at present to be feasible to control chronic carriers unless they are food handlers. If they are food handlers they ought to be restrained from pursuing their usual vocations and the health department should keep itself informed as to their where-abouts and their business. In order to prevent the development of carriers and to eliminate the danger period after convalescence, it would seem proper for local health officials to urge the administration throughout the course of the disease of urotropine, otherwise known as hexamethylen-tetramine.

Dr. Richardson says: "Approximately 25 percent of all typhoid cases show, especially in the later stages of the disease, the presence of the typhoid bacillus in the urine, and the specific germs may persist in the urine for months or even years. For the elimination of this danger, I recommended in 1898 the use of hexamethylen-tetramine under the name of urotropine, and the favorable results obtained by me have in general been confirmed by a great many other observers in other parts of the world. As in many other fields, however, prevention is much more easily brought about than a cure. That is to say, if there is present more than a simple bacilluria and if a true inflamatory process has been set up in the urinary passages, then the result of medication is much less successful and uniform. Where, however, the question is one of the simple presence of the bacillus in the urine, the results following the administration of hexamethylen-tetramine are almost theatrical. I have seen, for instance, a urine absolutely cloudy with typhoid bacilli become absolutely clear within forty-eight hours. In my opinion, therefore, hexamethylen-tetramine should be given as a urinary prophylactic in all cases of typhoid fever, and should be continued for at least two weeks into convalescence. A proper dose would be 5 grains three times a day, although in cases where actual inflamation exists larger doses can be given, even up to 15 grains every four hours.

In rare instances the use of this drug may be followed by painful micturition and haematuria. In such cases, of course, the drug must be omitted. There is no record of any permanent injury having been done by the drug.

There are a number of proprietary names for this drug, among which are urotropine, cystogen, aminiform and formin.

It is possible, furthermore, that the drug may be of value in restricting the number of typhoid carriers. Crowe has found that the drug is eliminated in the cerebro-spinal fluid and also in the bile. For this reason it is very possible that typhoid carriers who, in many instances at least, suffer from a chronic infection of the gall bladder, may be very materially reduced in number."

Besides the preceding suggestions which have to do directly with the personal sanitation of the patient, there are certain measures relating to municipal sanitation which are of importance in the prevention of typhoid fever. So far as the environment is concerned, the most important factor in the spread of typhoid fever is the privy vault. In it are stored the bacilli of the disease, and from it they may be distributed by flies, by the hands, and in badly constructed ones, by rats, dogs, cats, hens, etc. Moreover the privy is itself a breeding place of flies, and its mere presence on the premises encourages untidiness and the careless deposit of slops and excreta on the ground. Abundant evidence from all over the world shows that the removal of privy vaults causes a notable decrease in the prevalence of typhoid fever. Where there are no sewers privy vaults are often necessary, and it should be the duty of boards of health, a duty which is sadly neglected, to see that privy vaults are tight, covered and fly proof, and that the privy building is tight and sufficiently screened. Builders and contractors' privies should be looked after even more carefully than are house privies. Rules and regulations in regard to the committing of nuisances ought to be rigidly and continuously enforced by boards of health.

In order to more clearly bring these matters to the attention of boards of health the committee makes the following

RECOMMENDATIONS.

1. Local boards of health should make every possible effort to secure the prompt reporting of all cases of typhoid fever.

II. The State Board of Health should provide for the physicians and health officers of the Commonwealth, bacteriological examinations of blood, urine and feces for the presence of typhoid bacilli; it is also recommended that the local board of health laboratories take up this work as soon as practicable.

III. It should be the duty of every board of health to send a trained agent to the household from which a case of typhoid fever is reported, within 48 hours, for the purpose of seeing that the case is properly isolated, and the stools and urine effectively disinfected.

The Committee recommends that the stools and urine be disinfected with milk of lime, (one part freshly slaked lime to eight parts of water,) or chlorinated lime (6%), or carbolic acid (5%), or formalin (10%), or by boiling in soda solution. The discharges should be received in a vessel containing some of the germicidal solution, and more should be added so as to cover the mass and be equal to at least twice the volume of the material to be disinfected. The entire contents of the vessel should then be thoroughly stirred, special care being taken to disintergrate lumps. The vessel should be covered and allowed to stand no less than one hour before the contents are discarded.

The disinfectant should be furnished free of charge at the direction of the health officer.

IV. Local boards of health should investigate the source of infection, especially the milk and water supply, of every case of typhoid fever reported, and should send a copy of the report of such investigation to the state board of health.

V. Every house in which there is a case of typhoid fever should be placarded.

VI. All cases of typhoid fever should be isolated.

VII. All cases of typhoid fever should be given hexamethylen-tetramine throughout the disease, and for two weeks after the temperature becomes normal.

VIII. Isolation may ordinarily be terminated when the temperature has continued normal for two weeks, as certified by the attending physician. But patients who in their occupation are likely to infect food, should not be released until four consecutive negative cultures from stools and urine have been obtained.

IX. Bacilli carriers should under no circumstances be allowed to engage in occupations which necessitate the handling of food; for example, carriers should not be employed as cooks, or waitresses, or in any part of the dairy industry.

X. All carriers should be under the closest supervision of the local health authorities, and in case a carrier moves to another community, the health authorities of that community should be notified.

XI. It should be the duty of the local boards of health having cognizance of a case of typhoid fever on a dairy farm, in addition to other measures, to notify promptly the boards of health of the communities to which the milk from that farm is shipped.

XII. Wherever there is a public sewer, local boards of health should cause the prompt removal of all privy vaults, and where privy vaults are necessary, the board of health should cause them to be properly constructed.

XIII. Boards of health should institute active measures for fly suppression.

DR. CHARLES V. CHAPIN, Chairman,
DR. D. D. BROUGH,
DR. NELSON C. DAVIS,
DR. MARK W. RICHARDSON,
DR. M. J. ROSENAU,
DR. G. L. TOBEY,
DR. F. P. DENNY, Secretary.

* On motion of Dr. Chapin, Dr. Rosenau and Dr. Richardson were added to this Committee, having previously served unofficially.

DISCUSSION

Dr. DURGIN. I move that the report be accepted and adopted.

Dr. DENNY. It has been a comparatively simple matter for the committee to draw up these recommendations, for it has been known for a long time what precautions ought to be taken in typhoid fever. The real problem is to get these recommendations carried out. The infection extends so far beyond the limits of the town in which a case occurs that typhoid fever is not of mere local concern, and it is a question whether the precautions that are to be taken should be left to local option. The citizens of Massachusetts have a right to insist that certain precautions shall be taken in every case of typhoid fever. They should at least insist that every case be visited by a health official for the purpose of giving instructions and seeing that the proper precautions are taken. Now, how can we get even this done? It is probable that some boards of health may be stimulated by this report to increase their efforts, but if this subject is left with the mere publication of these recommendations it will be years before any adequate precautions are taken in Massachusetts to prevent typhoid fever. It has been proved in certain localities in Germany that the energetic application of these principles is sufficient practically to stamp out typhoid fever, and the only problem for us to consider is how we can get these things done here. As stated in the report, the committee considered the question of legislation as a means of securing more uniform and effective work on the part of the local boards of health, but there was a feeling that that would not be a popular measure. On the other hand, it may be said that many of the duties of local boards of health are at present prescribed by law. If you peruse the manual of the public health laws you will see that few if any of these prescribed duties of boards of health concern the health of the citizens of the state as a whole as much as would regulations in regard to typhoid fever. Of course we don't want any laws unless they are necessary, but it is necessary that the health of the people should be protected and that the present useless sacrifice of human life should be prevented; if this cannot be accomplished in any other way, then we must have legislation.

Prof. SEDGWICK. I should like to make an amendment to Dr. Durgin's excellent motion, in this form: namely, that the report of the committee be accepted and adopted, but that the committee be continued and requested to confer with the State Board of Health as to the best methods of making this report effective, the committee to report at a future meeting of the Association; and in support of that amendment I would like to say just a word. It has given me the keenest possible pleasure to listen to this clear-cut, scientific, definite report of the committee. We have now reached the point, as a body, which Dr. William Budd, one of the finest ornaments of the medical profession, reached forty years ago, and it is now our duty, it is especially the duty of the local boards of health, to put into effect the wise recommendations, the absolutely scientific recommendations, of this committee. The kernel of the whole matter, as I see it, is the recognition of typhoid fever as a contagious disease. Once that recognition becomes general, once its corollaries are appreciated, there need be no further difficulty. It then becomes the bounden duty of local boards of health to treat typhoid fever not in a vague kind of way as if it were a remotely contagious disease, but vigorously and as if it were an actively contagious disease, not as contagious as some others to be sure, but enough so to make it a great menace to the public health. And with these reflections, I would like to renew my motion for amendment.

Dr. PALMER. I would like to second that amendment, and I would like to say a word about it. A few years ago, when I had the honor to go about the State as representative of the State Board, I was amazed at what I found as to the constitution of the ordinary country board of health. These rules would apply particularly to the cities, where they have good boards of health, especially those represented by medical men; but I found in my travels in the different cities and towns that many boards of health have no medical men upon them, and if there is a medical man he is a political medical man, put there as a reward for some service, and the most that he does is to collect his fee from the town at the end of the year for the honor. I think no efficient legislation or regulation will be established until we have some improved method for the appointment of health officers in our

smaller cities and larger towns, and I have an idea as to how that can be done. We have under recent legislation state health inspectors by districts. Those men are well versed in the standing of the boards of health in the respective towns and cities over which they have an oversight. I think it would be a very easy matter for those men to recommend to some central authority, like the State Board of Health, men who will take an interest and be efficient in carrying out health duties. If some such scheme as that, improved upon if you will, could be carried out, I think we would see better effects from the report.

The PRESIDENT. Dr. Durgin accepts the amendment offered by Professor Sedgwick, and the motion now before you is that the recommendations of your committee be adopted, and that your committee be requested to confer with the State Board of Health and to report the results of that conference to a subsequent meeting of this Association.

(The motion was adopted by unanimous vote.)

Dr. JAMES B. FIELD. At a meeting of the Executive Committee it was voted to recommend that our annual dues without JOURNAL be fixed at $1; including a subscription to the JOURNAL $2.

(On motion of Dr. Field the recommendation was unanimously adopted.)

CHOLERA.*

By Prof. MILTON J. ROSENAU,
Boston, Mass.

Cholera has a way of its own, all its own. Like other things that are oriental, it is peculiar. It smoulders for years in certain parts of the world and then breaks loose from its confines, marches along the lines of trade and travel, and threatens to become pandemic. This has happened in the history of cholera a number of times, and as far as we are able to see we are at present confronted with such a pandemic. While we understand the cause of cholera pretty well, and realize its mode of spread, we do not know why it acts in this particular way. It is just like a spark in the forest or a smouldering fire in the underbrush, it may remain quiescent for some time, only burning as a little local fire, or it may threaten a great conflagration, or the wind, or the dryness, or the amount of vegetation, and the other factors, may favor the blowing of the sparks to distant parts, where secondary fires or secondary conflagrations are caused. That is very much the way that cholera acts. Of course we have certain guesses why cholera acts this way, and if there is time I should like very much later to refer to some of them.

I think it is very interesting to compare the spread of cholera that has occurred within the year with the last pandemic outbreak that has occurred within our memory, that is, in 1892, when the great epidemic occurred in Hamburg, in which time there were about 20,000 cases and almost 10,000 deaths. When cholera started from the Orient and came to Europe in 1892 and threatened this shore, the newspapers were hysterical. The pressure was so strong upon the President, that he forthwith ordered an absolute quarantine of twenty days upon all immigrants arriving in our country, and other measures that were extravagant, far beyond the needs of the case, were put into operation. I think those who understood cholera, as much as was under-

*From stenographic notes of extemporaneous remarks made at the meeting of the Massachusetts Asso. of Boards of Health, Oct. 27, 1910.

stood about it at that time, felt sorry that this extreme was resorted to, but we were in the hands of our friends: the public demanded that much be done. At that time I was a member of the Marine Hospital service, and received hurry telegraphic orders to proceed to one of our seaports for quarantine duty to carry out this order of the President and the extra regulations that were hurriedly made under more pressure. I remember distinctly at that time a few cases of cholera that occurred in New York at that time, and one of the newspapers had a sensational article of a suspected case of cholera that was said to have occurred in Chicago, and that some persons in Milwaukee, frightened by this report, cut the telephone wire for fear that in talking over the wire the infection might be carried from Chicago to Milwaukee.

Now it is a great comfort, and I think it is a very good sign of the progress that is being made in sanitary science, (the REAL progress that is being made), to contrast the conditions in 1892 with what is going on at present. The situation now is taken calmly. Efficient measures have been planned and are being carried out without unnecessary fuss. I think there is greater confidence in those who administer the quarantine and the public health measures, not only in connection with cholera, but with our other diseases, and I think above all that the people at large, through the education which has been gradually going on, have a greater confidence in the sanitary sciences themselves, so that when sanitarians state to the public that there is no danger, or very little danger, they accept that at its true face value and are willing to abide by it. That to me, as a natural born optimist, is one of the most favorable signs of the real progress that has been made during this brief span of less than a generation.

In 1892, as pointed out in a recent editorial in the "Journal of the American Medical Association," a sanitarian called attention to the fact that if cholera should get into this country it would seriously threaten large water-borne epidemics in such cities as Philadelphia, Chicago, Lawrence, Lowell and Albany, as all of those cities at that time drank a polluted water, carrying typhoid and other intestinal infections. Since then, the particular cities that were singled out have all improved their water supplies very much, either through sand filtration or otherwise, so that a

serious water-borne epidemic of cholera would be practically impossible. We still have rather large communities in this country, situated along the course of our interstate rivers, drinking raw water that may possibly become infected, but I should think for the most part that we are reasonably protected against any such water-borne calamity as visited Hamburg in 1892.

Without going into details, it is perfectly evident to anyone who has ever seen cholera that it is one of the easiest diseases of all to recognize. It does not require a trained physician; anyone who has once seen a case of cholera will know it when he sees it again. The trouble, of course, comes with the mild cases, the so-called missed-cases, and the carriers.

Fortunately, bacillus-carrying is not as frequent in cholera as it is in typhoid. In typhoid from two to four per cent of all persons who recover from that disease continue to shed the bacilli and thus become chronic bacillus carriers. We do not know the exact percentage in cholera, sufficient data not having been accumulated upon that subject, but from all the work that has been done we do know that within a few days, usually four days after symptoms have ceased, the specific organism disappears from the discharges. We also know definitely that people in perfectly good health, corresponding in all respects to the typhoid carriers, may shed the cholera organism, so that the danger, while less, nevertheless exists.

The bacterial diagnosis of cholera is based almost entirely upon its biological characteristics; that is, it must agglutinate with the specific serum and it must produce Pfeiffer's phenomena. It does not make any difference whether the organism is curved, like the classic vibrion that Koch described, or whether it is straight, whether it is round or whether it is spiral; if it will agglutinate with a serum in the ratio of one to a thousand it is considered to be the specific cause of cholera.

The details of the modern methods of diagnosing cholera in the laboratory I will not go into, but they have changed considerably since those that Koch first described.

As far as the methods of spread are concerned, at one time we looked upon cholera very much as we regarded typhoid, that is, as being a water-borne disease almost purely and simply. Perhaps this view in regard to cholera was accentuated by the original

experiments of Koch made in Alexandria, where he actually isolated the comma bacillus from the well from which the persons who were attacked with the disease drew their drinking water supply, corresponding very much to the classic case of the Broad Street well in London over fifty years ago responsible for the first well recognized water-borne spread of cholera. It is perfectly true that in some definite instances, such as those mentioned at Hamburg, etc., water has been and probably will again be the vehicle through which the specific cause of cholera is spread, but for the most part in cholera, just as in typhoid fever, more cases are spread through what is known as contact, through fingers, food, flies, etc., than through water. This was proven absolutely in the Philippines.

The history of cholera in the Philippines since the American occupation is particularly instructive in that regard as well as in certain others. Cholera in the Philippines smouldered and practically disappeared as far as any cases could be found clinically, and a careful search by bacteriologists in Manila connected with the Bureau of Science failed to find carriers. What they did find were persons shedding comma shaped organisms that resembled cholera but failed to give all the reactions that we recognize in the true cholera germ. All of a sudden, without rhyme or reason, a case or two of clinical cholera would appear, perhaps, in the city of Manila, and again in these cases, while clinically characteristic, the *typical* cholera vibrio could not be detected. However, in the next case, or perhaps in the third generation, that is, the third successive group of cases, the true typical organism could be isolated, and then there would be an explosion, cases cropping up, here and there all over the city. This would occur in and spread to different parts of the island. Sometimes the same thing would occur simultaneously in different parts of the island or in different islands of the Philippine group, and then gradually subside. This history has repeated itself there in several instances since the American occupation.

Careful studies showed that the people who were attacked certainly could not have been infected from a common water supply, and that for the most part the water which they drank was probably not the medium of conveying the disease, but that they received the infection in some other way. The disease, therefore, was

fought entirely along the lines of contact infection. It marched through one of those large islands just as it was spread across this continent by the miners in 1849 seeking their fortunes in California. During the cholera outbreak in the Phillipines a sanitary guard was placed at a narrow neck of land towards which cholera was traveling, and through the usual processes of isolation, disinfection, and detention where necessary, it was stopped absolutely at that point, just like the old story of Horatius at the bridge, showing that cholera can be stopped independent of the old notion that we used to have that it was almost entirely a water-borne disease.

That is exactly the way cholera is attacked at maritime quarantine, and that is exactly the way that cholera will be kept out; or at least the attempt is being made, and doubtless will be successful, to keep cholera out of this country. The plan of campaign consists first of all in detaining all immigrants who come from cholera districts, whether Russia or Italy, for five days under observation at the port of departure. If these five days have passed uneventfully, five days covering the period of incubation in the great majority of cases), they are then permitted to embark, however again being carefully examined at the time of embarkation. They are under the eye of the surgeon during the voyage, and upon arrival both the master and the surgeon of the vessel must certify under oath that no case of diarrhoeal disease has occurred on the voyage. At the port of arrival, we will say Boston, they again meet another barrier, where the quarantine officer again carefully examines all the personnel on board the vessel for cases or suspected cases, and finally, if everything is all right and they are permitted to land, the commissioner of immigration, through a plan that has been promulgated from Washington through the public health and marine hospital service, requires the commissioner of immigration to send the names of these immigrants through the state boards of health to the state to which these people are going, so that each state may keep track of these various immigrants. If anything happens, the health authorities are thus in possession of important information and are able to take proper measures so as to nip any growing infection in the bud. It is perfectly obvious that with all this we have a carefully planned and well executed chain of protection. We

might call it, a first, second, third and fourth line of defence, all in charge of capable and efficient and wide-awake officials; our country is well protected against an invasion of cholera, and further, we can have every confidence that even if a case should come in as a mild or unrecognized case, or a carrier, with our improved, though still imperfect, sanitation, we would not have any serious trouble from it.

Dr. C. V. CHAPIN. I would like to ask Dr. Rosenau what he thinks should be the duty of a local health officer who receives a list of names from the commissioner of immigration at the present time. Should he simply place that on file, or should he deem it his duty to hunt them up and keep them under observation, and if so, for how long?

Professor ROSENAU. It would be hard to formulate what should be done under all conditions, but as a health officer I should feel very much inclined to keep as close watch over those people and the neighborhood into which they go as the facilities at hand would permit, and if possible to send a trained agent at least say twice a week to those places, to visit those particular people, to keep track of them in that way for a period of say three weeks or a month. The ideal way is to require these people to report to the health officer every day for a specific period; if they do not come to take it for granted that they are sick with cholera and then to look them up.

INFANTILE PARALYSIS.*

By R. W. LOVETT, M. D.,
Boston, Mass.

The increased frequency of infantile paralysis in this country and in Europe in the last few years has attracted the attention of the medical world here and abroad, and much has been written on the subject. Certain matters are of interest and possibly of importance as bearing on the present situation.

I shall first deal with the general aspect of the question, and second with the disease as it has appeared in Massachusetts in the last four years.

That the disease has increased in frequency in various parts of the world is a matter of common observation, nor can this increased frequency be accounted for by the fact that the disease has of late attracted much more attention and that more cases have been reported. In the five years ending in 1904 there were reported from all over the world some 350 cases of epidemic infantile paralysis. In the following five years—the five years ending in 1909—there were reported from all over the world over 8,000 cases of epidemic infantile paralysis. This increase you will, I think, agree is too great to be accounted for by any increased observation on the part of the profession. Again, we may trust our own observation to a certain extent, and such epidemics as have this summer occurred in Springfield and Fall River did not take place and escape observation ten years ago.

The records at the Children's Hospital contribute a point of interest. For the last twenty-five years cases of infantile paralysis have been coming to the Outerpedic Department from all over New England, and the number of them continued more or less steady, increasing as the clinic increased up to 1907, when a very sharp increase in the cases occurred, appearing in the chart as a line almost vertical, about five times the usual number of cases occurring in that year. Since then it has dropped, but not to the level of former years.

*Read before the Massachusetts Association of Boards of Health, Oct. 27, 1910.

Of these 8,000 or more cases reported in the five-year period ending in 1909, five-sevenths of the total number were reported from the United States. It therefore seems to me pertinent at the present time to inquire if in the United States we can find any general factor which would have any bearing upon this very great and very serious increase. Ten years ago epidemic cases were reported by tens, whereas now they are reported by hundreds. The history of the large epidemics is as follows: The first really large epidemic occurred in Norway and Sweden in 1905, there being about 1,000 cases in Norway and 1,000 cases in Sweden. In 1907 an epidemic of about 2,500 cases occurred in New York, and in 1909 there were 1,000 cases in Massachusetts, and about 1,000 cases divided between Minnesota and Nebraska. In addition to this a fairly large number of smaller epidemics were reported from various parts of the country, including one of 140 cases in Cuba, where the disease had never previously appeared.

As far back as 1894 there was an epidemic of 136 cases in Rutland, Vt., and two other epidemics at least were reported from Massachusetts a number of years ago, one in North Adams and one in Gloucester, but no generalization of the disease followed. It is evident, therefore, that there is some condition now existing in the community which favors the spread of this disease which did not exist in 1894, when the Rutland epidemic occurred. I have therefore analyzed a few factors which it seems to me are of possible importance in this connection, and to which I would invite your attention.

It has been suggested that the New York epidemic of 1907 was brought here from Sweden, which brings up the whole question of immigration. A sharp increase in the number of immigrants coming to this country occurred between 1904 and 1907, the number rising from 800,000 in 1904 to something over 1,000,000 in 1905, 1906 and 1907, after which it dropped. There was therefore a large increase in our foreign population between 1904 and 1907, most of which passed through New York. Particular attention is to be paid to the Scandinavian immigration, because Norway and Sweden have been the chief seats of the disease in Europe up to a recent time. In 1905, 1906 and 1907 the Scandinavian immigration fell off decidedly from the figures of the preceding three years, and in 1907—the year of the New

York epidemic—there were 42,700 Scandinavian immigrants, a smaller number than had occurred since 1901, and since 1907 the Scandinavian emigration has dropped still further. So far then as the influence of immigration goes there was a decided increase of total immigration just prior to 1907, but a sharp falling off in the number of Scandinavian immigrants in the same period.

Of other general factors of possible importance in the spread of the disease, the next to be investigated was the question of passenger traffic in the United States, as to whether there has been a very marked increase in the number of people travelling in the last few years. In 1904 there were 715,400,000 passengers carried by the railroads, and in 1908 there were 890,000,000, the average number of passengers per train mile being in the first period 46, and in the second 54. This of course points to a decided increase in the railroad passenger traffic in the last five years.

The only available figures with regard to electric railway traffic are those of 1902 and 1907. In 1902 the number of passengers carried was 5,836,000,000, and in 1907 it was 9,500,000,000, an increase of about 4,000,000,000 people travelling on electric railways over the number five years before.

These two sets of figures certainly point to a greatly increased freedom of passenger travel, and as it has been shown repeatedly that the disease follows the lines of traffic in its spread, this fact is probably of importance.

Another factor with regard to travel is to be found in the increasing use of the automobile, and here the only figures which I have been able to analyze are those relating to Massachusetts. In 1905 there were 4,800 automobiles registered in Massachusetts. and in 1909 there were 24,000, that is, between 1905 and 1909 the number of automobiles in this state—which is probably typical of the condition in the country—increased five times. As the disease is not one confined to the lower classes this increased facility of traveling may be a factor.

The disease is one that occurs in the summer, and affects principally children. In consequence of this seasonal occurrence, which is practically a universal rule, there are three factors belonging to summer which are worthy of investigation as possible sources of infection. These are fruit, dust and insects. The

high cost of living has undoubtedly led to a diminished consumption of meat and presumably to an increased consumption of fruit. I therefore investigated what figures were available with regard to the traffic in fruit from the report of the Interstate Commerce Commission. This traffic has increased steadily between 1900 and 1908, the increase being from 1,000,000 to 2,000,000 tons a year, but there has been no sharp increase since 1904, the only sharp rise occurring between 1904 and 1905. Since 1905 it has been almost stationary. So far as these figures go, therefore, it would not seem as if there were any very noteworthy factor to be found in this analysis, although common observation would seem to point to the fact that in this community at least there are more fruit stores and apparently more fruit is in use than was the case five years ago.

Coming next to the question of dust, the rainfall of the country has been analyzed for two periods, first, the period of five years from 1900 to 1905, and second, the following five-year period from 1905 to 1910. The total rainfall of the last five years on the Atlantic seaboard has shown everywhere a diminution, reaching a high figure in New England. On the contrary, the regions in the Northwest affected by the epidemic of infantile paralysis in 1909 show an increased rainfall in the last five years, being as much in excess of the normal as New England was deficient. In the Middle Atlantic States, including New York, the rainfall in the two periods was practically the same. Excessive dryness in the last five-year period can therefore not be put down as a condition pertaining in affected regions, if one takes New England with Nebraska, Minnesota and New York.

The question of the prevalence of insects in its relation to the spread of the disease presents many difficulties. Although the height of the disease corresponds to the prevalence of flies as observed in some localities, in other localities it does not correspond to this increased prevalence, in some cases the maximum prevalence of flies having been noticed toward the end of June and in other cases toward the end of August. The question of insects must receive very much more extended and more careful consideration before any trustworthy conclusions can be drawn.

Summing up, then, the conclusions so far as they have been mentioned with regard to the country at large, there is no question

but that there is a very great increase in passenger traffic on railroads, electric cars and automobiles; that foreign immigration showed a sharp increase just preceding the prevalence of the disease in the United States; and that investigations as to fruit and dust give no noteworthy information.

Taking next the occurrence of the disease in Massachusetts in the last four years, there are certain facts which are of interest and possibly of significance. If the epidemic of 1909 in Massachusetts came from the epidemic of 1907 in New York it was after a two-year interval, and if the epidemic of 1907 in New York came from the epidemic of 1905 in Sweden, and if the 1909 Cuban epidemic originated from the 1907 New York epidemic two years also elapsed here, it also was after a two-year interval. This fact may or may not have some bearing on the question.

In Massachusetts in 1907 we had 234 cases. The disease was distributed through the state with no epidemic centers of importance, and the distribution of the disease corresponded roughly to the distribution of the population. In 1908 we had 136 cases, half of which occurred in an epidemic in Franklin County in the upper Connecticut Valley. In 1909 we had 923 cases, the epidemic center being in Boston and the neighborhood. In 1910, up to October 15th there have been reported 543 cases, with a serious epidemic center in Springfield, and another in Fall River.

So far as I know, the attempt of the Massachusetts State Board of Health to follow the disease year by year is the first one that has been made to study the behavior of the disease as it affects one locality, and I thought that possibly certain conclusions to be drawn from the results in this state since 1907 might be of interest.

Taking, therefore, the four years for analysis, the disease has appeared in general as one affecting river valleys more than other localities, having been in the four years more or less constantly present in some part of the Connecticut and Merrimac Valleys. It is not apparently a disease of the coast towns by preference. There are nearly fifty coast towns in Massachusetts, and of these the bulk have been immune in each of the four years. That a coast town, may, however be visited by an epidemic has been clearly shown by the experience in Boston, and Fall River. Of the river towns, on the other hand, in the lower Connecticut and

Merrimac Valleys it may be said that in each of these four years the number of towns that have been immune have been in the minority. In 1907, when the disease was least frequent, the bulk of the cases were on these two rivers.

It has been stated by writers on the subject that localities severely affected one year were likely to be immune in the following year, and although this to a certain extent is true, it must be stated with many qualifications, judging from the experience in Massachusetts. Marked prevalence of the disease in a locality is apparently sure to be followed by a diminished prevalence in the following year, but not necessarily by immunity. The epidemic in Franklin County in the upper Connecticut Valley in 1908 was followed by practical immunity in 1909 and 1910; Boston, with 299 cases in 1909, has had only 11 reported in 1910; but taking the state as a whole the severe epidemic of 1909 was not followed by the immunity that we had hoped for in 1910. In the same way Norway and Sweden, which showed 2,000 cases in 1905, in 1906 showed 500 cases, a marked increase over former years.

It may, therefore, be said that so far as the figures go they show that when a small community is affected by an epidemic, in the following year there are likely to be very few cases in that small community, but that taking a larger area once affected by a serious epidemic the figures at hand show that, although in the following year there will be a diminution in the number of cases it will probably not fall to the level which obtained before the serious epidemic.

Another curious factor bearing on the question of two-year periodicity already mentioned is shown by the behavior of the disease in the western part of this state. In 1907, in the extreme western part of the state, there were some 30 cases, with Pittsfield as a center. In the following year there were only three cases in this part of the state. In 1909, however, the disease again appeared here, some 80 cases appearing in a narrow strip along the edge of the state, again with Pittsfield as a center, but in 1910 there have been only six cases reported from this part of the state. This phenomenon has been shown more strikingly here than in any other part of the state.

The disease seems to blaze up unaccountably in communities previously immune and in communities previously moderately affected. Up to 1910 Springfield had been almost immune, and in 1910 there were 120 cases in the city and 45 more in nearby towns. Fall River, on the contrary, had not been previously immune, for in 1907 there were six cases, in 1908 four cases, and in 1909 ten cases, yet in 1910 there have been 81 cases reported there, with 50 cases in neighboring towns. Other large cities, however, like Lowell and Worcester, have kept along with a few cases each year, and have not yet shown epidemics. It cannot therefore be stated from our observation so far, whether the presence of a few cases from year to year in a city or a locality is to be regarded as a favorable or unfavorable sign, but it can be said that almost complete immunity in a city has in one instance been followed by a very severe epidemic. The part of the state that has suffered least is a belt running North and South the whole depth of the state, beginning a few miles East of the Connecticut River and ending at the East in a line running North and East about through Concord, Mass.

The distribution in the state will therefore be seen to be rather erratic, leading to the formulation of only one or two rules, the most important of these being, it seems to me, that a community seriously affected one year shows a small number of cases in the following year, but in some instances again a large number of cases in the second year; that large communities, both immune and lightly affected, may become the seats of serious epidemics; and that a large territory seriously affected one year, on the following year shows a greater number of cases than prevailed before the epidemic.

With regard to the transmissibility of the disease there is, so far as I know, no dissenting voice among recent writers. We have had in Massachusetts instances of immediate transmission and what have appeared to be clear instances of transmission by a third person. In studying cases in 1910 we have made a special effort to find out if possible at what stage of the disease it is most likely to be transmitted, and what the period of incubation is. These figures have not yet been analyzed, and it is impossible to present any conclusions at the present time. We are making an attempt to investigate animal disease in the state, and we have

now traveling for purposes of this investigation a veterinarian, who is visiting veterinary hospitals, stock farms, kennels and poultry farms with a view to finding out if there was more animal disease in the infected localities than in the state at large. The conclusions from this investigation will be given in the final report.

As you know, the disease has been made a notifiable one in Massachusetts, and other states have followed the same course in requiring notification and in advising quarantine. This course is also pursued in Norway, Sweden, Germany and Austria. A very admirable pamphlet has been issued by the German Health Office for the use of physicians, dealing briefly with the symptoms of the disease and advising isolation during the acute stage, disinfection of discharges and bed linen, and disinfection of the sick room. It also advises that children from affected families should not attend school during the acute stage. Whether the danger of transmission ends with the end of the acute stage is a matter which is to be settled by further investigation. It seems to me that a very important part of the future work of the State Board is to lie in the determination of the conditions under which transmission occurs, and if possible the determination of the sources of infection from the patient.

It seems to me that in the present state of affairs it is clearly our duty to advise quarantine and the non-attendance at school of children from affected families. On the other hand, the community is thoroughly frightened and proceeds to extreme lengths in its fear of the disease, and I think we should lend our influence to spreading the information that the disease is not apparently very "contagious" in the ordinary sense of the term, and that although we should counsel every precaution during the time when we have reason to believe that the disease is transmissible, we should also do what we can to induce a sane and reasonable view of the situation. We must draw conclusions with care, and we must take particular pains to be sure that we are not too much influenced by the panic which has originated this last summer and which still exists.

234 Marlboro St., Boston.

DISCUSSION

Dr. JOHN L. MORSE. My experience with the disease is, of course, not so much from the point of view of its epidemiology as from the point of view of diagnosis. I suppose as a pediatrician I perhaps see more of the early cases in consultation than do the neurologists or the orthopedic surgeons.

It seems to me that the diagnosis is practically impossible in the early stages. Infantile paralysis may begin with any sort of symptoms, those of a cold in the head, of a cold in the throat, of a gastric disturbance, of an intestinal disturbance, in fact of almost any disease. I have not found in most of the cases, the sweating, the marked nervousness and the hyperaesthesia which have recently been said to be characteristic of the disease. In my experience they are more often absent than present. What it really amounts to, therefore, is that we cannot make the diagnosis until the paralysis appears. We may suspect that a child may be coming down with infantile paralysis if there is an epidemic, or if he has possibly been exposed, but otherwise we cannot make the diagnosis until the paralysis appears. In some atypical cases we cannot make the diagnosis at all. Children have it and get over it and we don't suspect it. For example—in a small colony at the seashore eight children of about the same age were constantly together. They all had a disturbance of the gastro-intestinal tract. No one of them was sick enough to be in bed. After their return home, ten days later, one of them was found to have a slight paralysis of the legs. I am certain that the other seven also had infantile paralysis and recovered from it without paralysis. In the very severe cases we many times cannot recognize it but mistake it for meningitis or something else.

Something has been written of late about lumbar puncture in the diagnosis of infantile paralysis. There is no question that animal experimentation shows that there is an excess of cells in the cerebro-spinal fluid in animals during the latter part of the incubation stage. There is no doubt that there is an excess of cells and an excess of fibrin in the cerebro-spinal fluid, both in animals and in the human being, very early in the disease, before the paralysis appears. In some cases there is an excess of cells

after the appearance of the paralysis, but these cells very quickly disappear. That is to say, in order to make a diagnosis through lumbar puncture we have got to do our lumbar puncture before the appearance of the paralysis, and in order to get the cases of infantile paralysis we have got to do a lumbar puncture on every sick child, which does not seem practicable. It is, therefore, of very little practical importance in diagnosis.

There is a class of cases of infantile paralysis which is very much like meningitis, some of them resembling tubercular meningitis, others cerebro-spinal meningitis. It would seem as if lumbar puncture ought to help in these cases. Unfortunately, barring the presence of tubercle bacilli, which are rarely found in a routine examination, the cerebro-spinal fluid in early infantile paralysis has exactly the same characteristics as the cerebro-spinal fluid in tubercular meningitis, and it does not help at all in the differential diagnosis. Examination of the cerebro-spinal fluid does help in the diagnosis between infantile paralysis and cerebro-spinal meningitis, because there we have an entirely different picture.

More or less has been written about hexamethylenamin, or urotropin, as a preventive of infantile paralysis and in the treatment. It seems to me that it is reasonable that it may have some preventive action if it is taken during the stage of incubation. At that time, however, there is no apparent reason for taking it, so that in order for it to be of any use it must be taken by all children all summer, which does not seem reasonable. I don't see how it can be expected to be of much use in treatment after the paralysis has appeared, because after the paralysis has appeared the trouble is done and we cannot stop it. It may be of some use after the paralysis in preventing the escape of the organism from the body, because it must get out somewhere although we don't know how. It may kill off the organism and help in that way.

Everybody, I suppose, is convinced that these patients ought to be isolated and kept in quarantine much in the same way as in scarlet fever. The great difficulty comes in knowing how long we ought to keep them in quarantine. That is a question which arises in every instance. As far as I know, there is no data at all to tell us how long. The rule that I follow is three weeks. It

may be that three days is long enough; it may be that three months is necessary. I think the boards of health would do us a great service if they would give us some definite time, even if it is wrong.

We are sure that we ought to isolate the patients. The next question is: Ought we to isolate the attendants? Are the rest of the family to be isolated? Is the doctor going to wear a gown? Is he going to use the same precautions as he does in seeing diphtheria and scarlet fever? I don't think most of us do.

I am constantly asked as to what people should do to prevent their children from having infantile paralysis. The only answer that I am able to give them is to keep away from places, if they can, where there is infantile paralysis; that is, don't deliberately go to a place where you know there is infantile paralysis; if you are there, keep your children away from other people as much as you can within reason.

The PRESIDENT. The subject is now before the Association for discussion or question.

Dr. STEVENS. What Dr. Lovett said in regard to quieting this tremendous fear that is abroad seems to be very wise. I think every doctor in this community is asked practically every day by some of his patients what they can do to prevent their children having infantile paralysis. Many of the children are kept in the house and kept away from school. They are put in the very worst condition to resist disease. I know a great many children that are not allowed to go out of doors at all for fear they will get infantile paralysis, and I should expect those children would be in very much better condition to have it than they would if they played out every day. I had one case of infantile paralysis in a town adjoining Cambridge. The father of that boy is a sausage maker, working in the sausage factory, and there is the possibility that he may be spreading the disease broadcast if he is allowed to work. There are eight children in the family; one child is sick. The oldest child is twelve years of age, and the youngest one year. The boy who is sick is six years old. It is impossible to isolate that child. The board of health have

excluded the other children from school, and I rather think they have kept the father from going to work, but I am not sure about that. It seems to be important that he should be kept away from the sausage factory. This tremendous fear it seems to me ought to be allayed. I hope this Association will put itself on record as recommending such a measure.

(On motion, the Association adjourned.)

MUNICIPAL SANITATION.

By CHARLES V. CHAPIN, M. D.,
Superintendent of Health, Providence, R. I.

DISINFECTION OF THE HANDS OF ATTENDANTS IN CASES OF CONTAGIOUS DISEASE. It is well known that absolute disinfection of the hands, such as is desired in surgical practice, is extremely difficult. This is doubtless due largely to the fact that we here have to do with a number of extremely common forms of bacteria, some of which are normal inhabitants of the human skin. On theoretical reasons it seems likely that it is much easier to remove from the hands such bacteria as typhoid, or diphtheria bacilli, cholera spirillae or gonococci, for these would probably be only upon the surface of the skin. Gaehtgens* has been investigating different methods of cleansing the hands after infection with typhoid bacilli. He finds that thorough washing with soap and water, followed by rinsing and wiping on a clean towel, are extremely efficient, but do not always render the hands free from all the germs. He has found alcohol more efficient than the use of more powerful disinfectants. It is desirable, if possible, to avoid the use of disinfectants, even alcohol, if the hands have to be frequently washed. If they can be washed in running water, much better results are obtained than when they are washed in a basin, even though they are thoroughly rinsed in another basin.

In the hospital for contagious diseases in Providence a mixing cock is used in all the set bowls, and both the hot and cold water faucets have levers 8 inches long, which are readily operated by the elbow, so that the handles of these faucets need never be infected. The hands are washed in running water, which can always be of the desired temperature. No disinfectants are used. Since the hospital was opened, last March, about 150 cases have been treated in the "cubicles" where different diseases are cared for by the same nurse. There has been, thus far, one instance of cross infection.

*Arch. f. Hyg., 1910, LXXIII, 233.

RECURRENCES FOLLOWING DISINFECTION AFTER SCARLET FEVER.* In Buffalo, in 1909, there were 3,029 cases of scarlet fever. Disinfection is said to be very carefully done in that city, and is tested by control cultures, and if found imperfect is done again. There were 117 recurrences of the disease after disinfection. This is at the rate of 3.8 percent. In Providence, since disinfection was abandoned, the recurrences after the removal of the warning sign for scarlet fever, have been at the rate of 2.81 per cent. of the cases.

RULES FOR THE KEEPING OF FOWLS AND PIGEONS.† The following rule has been adopted in the District of Columbia. "No person shall keep any kind of domestic fowl or pigeons within the District of Columbia within 25 feet inside the fire limits, or 50 feet outside the fire limits, of any structure owned by another and used for human habitation, occupation, or assembly, whether the said structure be in the same or an adjacent block or square, nor shall such fowls be permitted to run, fly or stray within 50 feet of any such structure. No such fowls or pigeons shall be kept in any square, or block having 75 per cent. of its lots improved, without a permit from the health officer of the District of Columbia, nor otherwise than in compliance with the following conditions." Then follow rules in regard to the cleanliness of houses, perches, nests, drinking fountains and yards, and finally it is specified that "No roosters are to be kept on the premises without the consent of the majority of the householders in that square or block."

TUBERCULOSIS TREATED IN CONTAGIOUS DISEASE HOSPITAL.‡ Forbes states that at the hospital for contagious diseases in Brighton, England, there have been cared for, during the last eight years, 1200 cases of consumption. None of these patients have contracted any other disease. The wards for the tuberculosis cases are quite near the scarlet fever ward, but separate nurses are provided for the tuberculosis patients, and these nurses eat and sleep apart from the other nurses. In Providence, since May last, the second floor of the diphtheria ward has been filled with consumptives. The nurses do not eat at a separate table, but mingle freely with other nurses.

* Report of the Department of Health, Buffalo, 1909, 20, 44.

† Report of the Health Officer of the District of Columbia, 1909, 73.

‡ Medical Officer, 1910, IV, 184.

DANGER FROM SOIL EXCAVATION. It seems rather surprising that at this late date the public should be afraid of emanations from freshly upturned soil. Yet recently, at least two health officials have had to meet very strong opposition to sewer construction on this account. Their observations may be of interest to others in a like situation. Guiteras* states that of 63 cases of typhoid fever which occurred in Havana during extensive sewer construction, not one was on the line of the work. Guiteras recognized the possibility of accidental infection of broken water pipes from workmen or soil during the progress of the work, and made special effort to guard against this. Systematic examinations were made of the soil to determine the presence of hook-worm larvae, but none were found. He believes, as do others, that the chief cause of an increase in malaria which sometimes follows operations of this kind is the importation of laborers who are harboring the malarial parasite. To guard against this in Havana Guiteras had the blood of every laborer examined for the *Plasmodium.*

Greene, of Charleston, studied the distribution of typhoid fever, scarlet fever and diphtheria, in relation to the work of excavation in that city and found that there was no reason to attribute to the overturning of the soil any cases of these diseases. There was no excess of typhoid fever, and of the 95 cases which occurred during the period under observation, only one, or possibly two cases, occurred along the 16 miles of excavation, and which in point of time were connected with the work of excavation.

SCHOOL INSTRUCTION CONCERNING INSECT CARRIERS. The very great importance of insect carriers in the south, has lead some cities as San Antonio and Jacksonville, to make great efforts to popularize knowledge concerning them. Terry states that in Jacksonville a series of moving picture shows, illustrating the life habits of flies and mosquitoes are given in the opera house, and all school children are required to attend. Special instruction is given by the teachers in a course of several lessons. Two prizes are offered for each school for the best essay on the subject, and two more prizes for the child who reports to the health department the largest number of breeding places of flies and mosquitoes.

*Sanidad de Beneficencia, 1910, III, 528.

AN ELASTIC WARD UNIT FOR CONTAGIOUS DISEASES. Dr. S. S. Goldwater, of Mt. Sinai Hospital, New York, has published in a recent number of the Bricklayer (Boston) a paper on the above subject. The design is for a hospital for a small or moderate sized city. Such hospitals usually consist of two wards, one for scarlet fever and one for diphtheria. Instead of two wards, Goldwater recommends a single ward considerably subdivided into rooms for one, two, three or more patients. There is connected with each end of the building a kitchen, nurses rooms and other administrative offices. If there chanced to be much diphtheria, and little scarlet fever, the larger part of the ward would be occupied with cases of the former disease. If now diphtheria should decrease and scarlet fever increase, as the diphtheria rooms became vacant, they could be successively shut off from the diphtheria end and connected with the scarlet fever end and used for the reception of scarlet fever cases. This of course, is a much more economical arrangement of ward space than is two entirely separate wards. Probably the reason why this plan has not been adopted before is because of the fear that it would be difficult to thoroughly disinfect the rooms, or that the germs would fly out of one window and into the next. Such fears have been shown to be groundless and there is no reason why the principle advocated by Dr. Goldwater should not be followed in the construction of hospitals for contagious diseases.

THE NOTIFICATION OF MEASLES. Sandilands, Medical Officer of Health of Kensington, London, Eng.,* comes to the conclusion that under present conditions the isolation of measles is of practically no effect in checking outbreaks, and that disinfection after the termination of the disease is unnecessary. He does believe, however, that much can be accomplished in checking the mortality of measles if severe cases occurring in the families of the poor, could receive hospital treatment. He thinks that a certain amount of space should be set apart in hospitals for contagious diseases for the treatment of cases of measles which require it, and he considers notification desirable in order that such cases may early be brought to the attention of the health officer.

* Pub. Health, 1910, XXIV, 26.

BIOLOGICAL LABORATORY NOTES.

By FREDERIC P. GORHAM,
Associate Professor of Biology, Brown University.
Bacteriologist, Providence Health Department.

DIFFERENTIATION OF B. PARATYPHOSUS AND B. TYPHOSUS. Kuhnemann* reports that the Loeffler method of staining the flagella shows that the relative proportion of the whole mass of flagella to the body of the bacillus is much greater in the case of the paratyphoid than in the typhoid bacillus. In the former the flagella are longer and more convoluted, while the flagella of the typhoid are fewer and shorter. The absolute number of flagella in both forms is variable but as a rule the paratyphoid has more than the typhoid.

DISEASES OF MUMMIES. M. A. Ruffer† reports a study of the diseases of Egyptian mummies of 5000 to 8000 years ago. He finds the lesions of pneumonia in some of the lungs and has succeeded in staining the organisms. He suggests that in another case the organisms which he found in the lungs may have been those of plague. He found cysts in the kidneys containing organisms which he says much resemble *B. coli*, in another, numerous eggs of *Bilharzia haemalobia* and in others urinary calculi.

DESSICATED CULTURE MEDIA. E. T. Thompson‡ investigated the practicability of preparing dessicated culture media using nutrient gelatin, agar, beef broth and MacConkey's neutral red bile-salt lactose agar. After these were dessicated and redissolved in distilled water at 100° C. the resulting media were quite clear and the agar and gelatin solidified with their original firmness. The reactions remained unaltered. Vigorous growth occurred with the several organisms which were tried and all the typical reactions were obtained. The advantages of such dessicated media prepared by standard methods will be apparent to all laboratory workers.

* Centbl. f. Bakt. Erste Abt. 53, 1910, 473.
† Cairo Scientific Jour. VI, 1910, No. 40.
‡ Lancet, May 21, 1910, p. 1411.

ACID-FAST AND GRANULAR TYPES OF TUBERCLE BACILLI. Wehrli and Knoll* found that a certain number of tubercle bacilli were stained both by the Ziehl-Neelsen and by Much's modification of Gram's method, a small number, however, could only be demonstrated by the former process, while about 50% were not acid-fast but retained the stain by the Gram-Much method. P. Wolff obtained similar results in smears from mesenteric glands of twenty-one children, and S. Rosenblat found similar conditions in the sputum. The two last named authors agree in regarding the granular bacilli as degenerate forms possessing a low degree of virulence, and they believe that under favorable conditions they may acquire anew the acid resisting capsule and thus return to the Ziehl-Neelsen type.

CULTIVATION OF LEPROSY BACILLI. Many attempts have been made to grow upon an artificial medium the acid-fast bacilli that are associated with the lesions of human leprosy. Clegg† grew an acid-fast bacillus from human leprous tissues with ameba and their symbiotic bacteria. Sugai‡ inoculated Japanese dancing mice with leprosy bacilli which multiplied at the site of inoculation and became disseminated throughout the animal's body. The successful transmissibility of leprosy to this species of mouse affords an excellent opportunity to determine whether or not the acid-fast organisms cultivated upon an artificial medium are in reality leprosy bacilli. Duval,§ recognizing the fact that leprosy bacilli are confined to the interior of body cells, prepared an artificial medium which was composed in part of substances which are the result of cell metabolism and the end products of proteid digestion. Portions of fully matured bananas were prepared aseptically, and introduced into sterile glass cylinders, provided at the bottom with cotton plugs saturated with sterile distilled water. The banana was then saturated with 1% solutions of tryptophane, cystein (made from protein) and leucein sterilized by filtration. A 2% nutrient agar of 1.5% titer was also

* Beitrage z. Klinik d. Tuberkulose Bd. 14, 1909, H. 2. (Centbl. F. Bakt. 1st Abt. Ref. XLVI, 1910, 397.)

† Philippine Jour. of Science, IV, 1909, 403.

‡ Lepra, VIII, 1909, 203.

§ Jour. Exper. Med. 12, 1910, 649.

used with the above mentioned solutions. Both the banana and the agar when saturated with a 1% solution of cystein proved excellent media when grown at 32°–35° C. exposed to the light in a glass incubato . Leprosy bacilli developed in the original cultures and continued to grow in subcultures. The morphological and cultural features were studied and inculations in Japanese mice produced typical leprous lesions. The author is at present at work upon the production of an immune serum.

SANITARY ENGINEERING NOTES.

By ROBERT SPURR WESTON,
Assoc. M. Am. Soc. C. E., Boston, Mass.

ILLINOIS WATER SUPPLIES AND TYPHOID FEVER.* The author compares the typhoid fever death rates and the characters of the water supplies in the various counties of Illinois. The largest death rates are in the southern part of the state where the municipal supplies for the most part are from unfiltered sources and the rural supplies from wells in the shallow glacial drift. In this half of the state average typhoid fever death rates of over 40 per 100,000 for five years were common, and only one out of 51 counties had a death rate of less than 10 per 100,000 for five years; while in the northern half where most of the supplies came from deep wells in rock or in the glacial drift, there were 13 counties which had a death rate of less than 10. In the deep well section, which is northwest of a line drawn from Quincy to Chicago, there are only three counties with a death rate of over 25, and even better conditions prevail in the deep drift regions where none of the average death rates exceed 20. The only county in the northern section with a death rate of more than 40 is located outside of the deep drift area and the only one in the southern portion with a death rate of 10 is located in the same area, where not only excellent supplies for cities but even for farms and houses are obtained. In the southern part of the state good ground water supplies are scarce and the supplies from surface sources are not satisfactory as a class, which facts account in part for the high death rates. The improvement in conditions at Chicago, where the death rate has been reduced from 173 to 15.6 during 17 years is due to the extension of the water works intakes into Lake Michigan and the diversion of the sewage into the Chicago drainage canal. The author's statement that a further reduction in the death rate to 7 or 8 per 100,000, like that which prevails in Rockford, Ill., and in some European cities is possible, is undoubtedly true, but in order to reach this result not only must the water supply of the city be pure but other causes of infection and contagion must be overcome as well.

*E. Bartow, Eng. News.

ADDITIONS FOR WATER PURIFICATION.* Author gives excellent rapid method for the determination of the lime and soda required to soften water. 200 cc. of the cold water to be softened are mixed with 50 cc. of saturated lime water of known strength in a 250 cc. volumetric flask and heated to boiling. The strength of the lime water must be determined for each series of determinations. After cooling, the flask is filled to a mark with water, the contents are mixed and 200 cc. are filtered through a dry filter and titrated in a porcelain dish with $\frac{N}{10}$ HCl with methylorange as an indicator. The number of cc. of equivalent tenth normal lime used by the water multiplied by a factor gives the amount of lime required per million gallons. Then one adds to the neutralized solution in a porcelain dish 20 cc. $\frac{N}{10}$ Na_2CO_3 and heats to the beginning of boiling. The contents are then washed into a 250 cc. flask, cooled, filled up, mixed and filtered. 200 cc. of the filtrate are measured off and the excess of alkali titrated with $\frac{N}{10}$ HCl. The number of cc. of soda solution used by the water multiplied by a factor equals the number of pounds of pure sodium carbonate required per million gallons. The solutions must be accurately prepared. The correctness of the above amounts for the desired effect can only be proved by a practical experiment. For this purpose the author takes one liter of water and adds the calculated amounts of dry lime and soda and heats the whole to 70° C. Water treated in this way as a rule has a slight soda alkalinity and a hardness of less than eighteen parts per million.

THE PRODUCTION AND NEUTRALIZATION OF OZONE FOR WATER PURIFICATION AND OTHER PURPOSES.† Article notes date of discovery of ozone by Van Marum, 1783, and its properties. Its use has been very popular, but on account of the high cost commercial production has been possible only since the development of the alternating current generator and the high tension transformer.

The article describes many of the innumerable generators, including those by Tindal, de Frise, Siemens-Halske, Otto, Abraham

* Drawe, P., Z. Angew., Chem., 23, 52.

† Eng. News. Editorial and Original. 63, 488–499.

Marmier, Vosmaer, Bridge, Gerhard, Stynis and others. The modern machine produces concentrations as high as 10 grams of ozone per cu. m. of air and some of the new generators will yield as high as 100 grams per hour.

The efficiency of O_3 as a bactericide and oxidizer of organic matter is well known. Even imperfect mixtures of grossly polluted water and ozonized air in crudely contrived laboratory apparatus effect almost complete purification, but such facts do not place the water purification on a commercial basis. There is no change in the physical appearance of the water after treatment with O_3 and filtration is usually necessary in connection therewith. Ozone treatment is best adapted to sewage polluted waters whose appearance is satisfactory. Waters of turbid streams are least suited thereto. The process has to compete with the $Ca(OCl)_2$ process, which has nearly the same effect and is cheaper. One objection to the treatment is that the electric apparatus is delicate andcomplicated and requires skilled attendance. The O_3 processes are not yet standardized and at present it is difficult to determine what waters would be best treated by ozone. On the other hand, the effect of O_3 is unique in that it has almost no injurious effect on higher organisms when used for general sterilization. Its use as a special therapeutic agent is only at its beginning. Its use for water purification, however, should be carefully considered with reference to the special cases under consideration before adoption.

SEWAGE SLUDGE AND ITS INDUSTRIAL USE.* Author describes experiments in the city of Brunn in Austria made by Prof. Honig. The sludge, which is from the sewage of an industrial city, was dried in an experimental plant by means of a revolving drum filter covered with cloth and said to be self-cleaning. The dried cake contained 25% of water. 100 kg. of this mixed with 2 kg. of pit coal when distilled produced 23 cubic meters of good illuminating gas and 75 kg. of NH_3. The decision to utilize the sludge for the manufacture of gas was determined upon after experiments with other methods. Filter presses and centrifugal machines dried the sludge less well than did the hollow drum filter. In the latter the water filtered from the sludge is

* Bayer, A. Rev. chim. ind., 21, 279–83.

removed continuously by a pump while a jet of compressed air acting upon sections of the drum from the inside in order blows off the cake from the outside in the form of scales two or three mm. thick. With the machine they were able to obtain 33.3 kg. of dried sludge containing 22.5% of dry matter per square meter of filter surface. The filtering pressure required was 200 millimeters of mercury while the air was used at a pressure of 1½ atmospheres.

FORMATION OF NH_3 IN DEEP WATERS CONTAINING IRON AND MANGANESE.* Klut and Noll exchanged communications regarding the presence of ammonia in deep well waters, and especially in those containing iron and manganese. They are not agreed upon an explanation for the presence of ammonia. Both investigators await the results of further investigations. Other articles on the same subject by the same authors appeared in the same journal.

VALUE OF A CHEMICAL ANALYSIS AS SHOWN IN TRACING THE CAUSE OF A TYPHOID FEVER EPIDEMIC IN GEORGIA.† An instance where a typhoid epidemic was traced through chemical analysis to a water supply which had been declared safe after a bacteriological examination.

WATER PURIFICATION.‡ The author, who has published a short method (Z. oeff. Chem. 1907. 457) for the determination by computation based upon analyses of the chemicals necessary for water softening, criticises Drawe's method, which is based upon actual experiments with the water examined using lime water and sodium carbonate as reagents. The criticism is based largely upon the fact that simple determination by trial of the lime and soda required with no knowledge of the actual chemical composition gives an insufficient idea of the character of the water and no inkling that reagents other than lime and soda, for example NaOH, may be used to advantage. He believes it to be necessary to ascertain the presence or absence of certain

* Klut. Z. angew. Chem., 23 1934.—23, 1306, 107, 1307.
† H. B. Arbuckle, J. Ind. Eng. Chem., 2, 349–50.
‡ Hundeshagen, F. Z. angew. Chem., 23, 1262. 23, 878.

substances, like sulphates, iron and manganese. He states that an error might be introduced by using Drawe's method with waters containing large amounts of Mn and Fe for the reason that one part of hardness ($CaCO_3$) per million is equivalent to 0.56 parts Mn, 0.55 Fe, or 0.374 Fe. He recommends the term "non-carbonate hardness" to describe the hardness due to mineral acids, etc., in distinction to the carbonate hardness. He takes exception to Drawe's statement that carbonate hardness (alkalinity) is ever greater than the total hardness. Drawe in reply agrees with Hundeshagen that the total hardness consists only of calcium and magnesium carbonates and corrects a former mistake in his formula for estimating the necessary addition of chemicals to water containing an excess of alkaline carbonates.

PERSONAL HYGIENE.

By PERCY G. STILES,
Assistant Professor of Physiology in Simmons College.

Humidity.

An important work of the past year is Ronal C. Macfie's "Air and Health." (E. P. Dutton & Co., New York, 1909.) Among its well classified sections the two entitled "Humidity and Thermolysis" and "Humidity and Health" repay careful reading. The subjects of which they treat have seldom been so well presented.

It may be doubted whether any practitioner or physiologist feels satisfied with the reasons he is able to offer for the effects of dampness upon the human economy. The matter seems to call for a great deal more exact observation than has yet been given to it and for a rigorous separation of its purely physical aspects from those in which suggestion is involved. Every one has witnessed examples of an abnormal sensitiveness to changes of weather not by any means limited to distinctly hysterical individuals. An explanation is so difficult that a cautious and able writer (Tigerstedt) resigns the task and says that these agencies can only be accepted as "cosmic influences." Others, like Arrhenius, have emphasized the possible role of electrical changes as mediating between the outer world and the human system. In the chapters before us this serious lack of knowledge is admitted but we have an interesting collection of the facts already at hand. We have also some helpful criticism of the loose statements common in discussions of the subject.

We are reminded that the term "relative humidity" is of little value by itself. An approach to saturation does not hinder evaporation from the skin or from the respiratory passages unless the original temperature of the air is very high. A fully saturated cold air ceases to be saturated when the skin or mucous membrane warms it and therefore it abstracts water readily from such surfaces and absorbs heat in the process. The amount of water which the air can hold is approximately doubled for a temperature increment

of 27° Fahrenheit—a most convenient datum for rough calculations.

Dr. Macfie makes the suggestion that instead of referring to the relative humidity of air, which means little unless we consider temperature also, we may give the drying power of the air, that is the quantity of additional water which can be taken up beyond that already present when the temperature is raised to 98° F. This would be a distinctly physiological value and would indicate to a great degree the fitness of any particular atmosphere to environ warm-blooded animals. It is only with high temperatures that there can be any lack of drying capacity in this sense. Saturated air at 89° F. will not relieve the human system of its heat as fast as produced and a fever temperature will develop (Haldane). It is a paradox worth reasoning out that air at 131° F., containing the same amount of water as the saturated air at 89°, will take care of the heat production by virtue of the brisk evaporation which it permits.

Clearly enough excessive humidity sets a limit to human endurance when it accompanies high temperatures. How then does it affect us when the thermometer is low enough to insure against any failure to remove heat from the body? In the first place it lessens radiation. Thus the presence of much water vapor in the air may reduce the rate of heat transfer between the body and a cold wall. Similarly it lessens the heating effect of radiations coming to the body from the sun or from terrestrial sources. But with decidedly cold air and especially with air in motion the saving of loss by radiation is greatly overmatched by increased conduction. Hence dampness adds discomfort to winter as well as to summer weather. The surface temperature of the skin is lowered more by a moist than by a dry atmosphere when both are below the neutral region of 62–68° F. The vasomotor changes which serve primarily to protect the body against loss of heat but which incidentally threaten to cause internal congestions are directly in proportion to this lowering of surface temperature.

In view of what has been said we can understand the influence of high humidity with cold winds in producing conditions which invite infections of the mucous membranes. Modified vasomotor reactions may be the key to many other relations between humidity and health which have appeared obscure. We know the general

truth that surface cooling causes engorgement of internal organs but we do not know well what areas share in the reaction. Altered circulatory conditions in muscles and about the joints may possibly suffice to explain the discomfort of people with rheumatic tendencies when a chilly east wind sets in after a warm dry period. Dr. Macfie's supposition that the checking of perspiration actually limits the essential excretion of wastes is contrary to the general impression among physiologists. His suggestion that bacterial infections are more virulent in times of high humidity because the organisms have not suffered dessiccation may have some weight.

It is possible that the depression one experiences on passing from a dry to a wet atmosphere may be due in part to altered breathing movements. Dry air produces a tingling within the nostrils and a reflex reinforcement of the respiratory muscles. Brisk breathing has a general bracing and enlivening effect. Damp air if warm fails to produce such stimulation and the breathing sinks to a more shallow and indolent type. The sense of buoyancy and well-being produced by air freighted with certain odors—such as the so-called "salt smell" of decaying sea-weed—is probably secondary to deepened breathing which has set in with no conscious effort.

VETERINARY NOTES.

By W. L. BEEBE, D. V. M.,
Bacteriologist for the Minnesota Live Stock Sanitary Board.

REPORT OF THE INTERNATIONAL COMMISSION ON THE CONTROL OF BOVINE TUBERCULOSIS. At the September, 1909, meeting of the American Veterinary Medical Association, which was held in Chicago, an international commission on the control of bovine tuberculosis was appointed, the personnel of which is as follows:

W. C. Edwards, who for many years served in the House of Commons in Ontario and was elected Senator in 1903;

J. J. Ferguson, who is employed by the Swift Packing Co.

J. W. Flavelle, LL. D., a capitalist of Toronto and manager of the Wm. Davies Co., exporters and domestic bacon curers.

Ex-Governor W. D. Hoard, Wisconsin;

Dr. C. A. Hodgetts, Chief Health Officer of the Province of Ontario;

Dr. J. N. Hurty, Secretary State Board of Health, Indiana;

Dr. John R. Mohler, Chief of the Pathological Division, Bureau of Animal Industry, Washington;

Dr. V. A. Moore, Director of the New York State Veterinary College, Cornell University;

Dr. M. P. Ravenel, University of Wisconsin;

Dr. C. E. Schroeder, Superintendent of Experiment Station, Bureau of Animal Industry.

Mr. T. W. Tomlinson, Denver, Colo., Secretary of the American National Live Stock Association;

Dr. Frederick Torrence, Director of the Faculty of Comparative Medicine, University of Manitoba;

Dr. J. G. Rutherford, Veterinary Director General of Canada;

Prof. M. H. Reynolds, Professor of Veterinary Science, University of Minnesota.

The commission was instructed to study the problem of tuberculosis among cattle and to report at the next meeting of

the Association upon reasonable and economic methods or systems to be recommended to both officials and live stock owners for the eradication of this great scourge of domesticated animals.

The commission held four meetings during the past year and recently made its report at the San Francisco meeting of the Association. In view of the personnel of the commission as selected by the association and of the fact that so much information on the subject has been made available through the work of similar bodies in other countries and researches of scientific and practical men in America and elsewhere, the commission did not deem it necessary to take any evidence either from expert witnesses or others. The commission realized that they could deal with fundamental principles only and that the details of the policy which they might outline must in each case be worked out by duly authorized and responsible representatives of the community immediately concerned. The history of the various efforts hitherto made by other countries throughout the world that have attempted to legislate on the subject was thoroughly studied. This led to the gradual elimination of methods other than those which might reasonably be adopted by any community. It was felt, in view of the prevalence of the disease, especially in some localities and among certain classes of cattle, the difficulty of providing a sufficient number of trained officials and the large economic questions involved, to say nothing of the numerous expenditure, that it would be unwise for the present at least, to seriously discuss the policy of universal compulsory testing and slaughter.

The committee report is divided into 15 resolutions and four subcommittees were appointed to minimize the risk of omitting from the deliberations of the committee any phase of the question. The four subcommittees were as follows:

1. Education and legislation.
2. Location of tuberculosis.
3. Dissemination.
4. Disposition of tuberculous animals.

The reports of these subcommittees are of particular interest.

There are many points in these resolutions that are of particular interest, and will probably prove of much value to those who are interested in this work.

The following is a brief account of some of the phases of the report. The management of live stock shows should give a preference to cattle known to be free from tuberculosis, either by providing special classes for such cattle or in some other practical way, and should always take precaution to prevent contact between such animals and those not known to be free from the disease.

The tuberculin test properly applied is an accurate and reliable diagnostic agent for the detection of tuberculosis. Tuberculin will not produce a reaction under the following conditions:

a. When the disease is in a period of incubation.

b. When the progress of the disease is arrested.

c. When the disease is extensively generalized.

All exposed animals should be retested at intervals of six months to a year. The commission recognizes that the discovery of tuberculosis in animals slaughtered for food purposes furnishes one of the best possible means of locating the disease on the farm, and therefore recommends the adoption of some system of marking for identification all cattle three years old and over shipped for slaughter.

That the policy of compensation be recommended as useful and usually necessary as temporary means. When slaughter is necessary in order to avoid economic loss every effort should be made to utilize as far as possible the meat of such animals if slaughtered under competent inspection. That with the hope of preventing the spread of infection, persons buying cattle for breeding purposes or milk production should except when such purchases are made from disease-free herds, which have been tested by a qualified person, purchased only subject to the tuberculin test.

The commission especially desires to appeal to the press, metropolitan, agricultural and local, to join in the work of extending as much as possible among the people the conclusions here arrived at.

They recommend that resolutions regarding the control and eradication of tuberculosis among domestic animals be made uniform; that the laws of the United States and Canada, and other American countries for the admission into America of animals from without be made stringent and as much alike as

possible; and that the laws governing the interstate and interprovincial movement of cattle and that between different American countries be harmonized.

Legislation is especially required to prevent the various frauds which interfere with the satisfactory use of tuberculin, as a diagnostic agent for tuberculosis, as well as for the official supervision over all tuberculin sold to be used by veterinarians and others.

None of the various methods for the immunization of animals against tuberculosis has passed beyond the experimental stage. The commission is unable to endorse any of these for practical use at the present time. The consideration of the eradication of tuberculosis among animals should have the approval and support of all those persons who are interested in curtailing human suffering and prolonging human life. The control, to say nothing of the eradication of tuberculosis, is impossible of achievement without the hearty cooperation of the men who are actually engaged in the cattle industry.

In concluding the report the commission suggests that the association should make such provision as may be necessary to carry on the work, either by continuing the commission as constituted at present or with such changes in their personnel as may be considered desirable.

SPOROTHRIX AND EPIZOOTIC LYMPHANGITIS. Epizootic lymphangitis, a disease that somewhat resembles glanders has long been known to exist in Europe, Africa and Asia, and recently was reported to exist in Pennsylvania. The disease is characterized by the appearance of subcutaneous nodules with thickening of the surrounding lymph vessels. The nodules frequently break down forming multiple abscesses which finally heal in most instances. Page Frothingham and Paige* have recently been doing some work on this disease. The material was obtained from cases in Pennsylvania and from their work they conclude that the horses from which the tissue was obtained were apparently not affected with the epizootic lymphangitis of Tokishiga. The only organism to develop a sporothrix is unlike the *saccharomyces farciminosus*, but is identical with that isolated by Dr. Hyde from a man.

*Journal of Medical Research, Vol. XXIII, No. 1, pp. 137–148.

METHODS EMPLOYED IN NORTHERN EUROPE IN THE CONTROL OF BOVINE TUBERCULOSIS. Dr. V. A. Moore presented a paper at the recent meeting of the American Veterinary Medical Association in San Francisco, in which he very carefully describes the methods employed for the control of bovine tuberculosis in Northern Europe. The difficulties attending the control of this disease in Northern Europe are not essentially different from those in this country. Their methods or system of control which have been adopted there, differ from those employed in America. It is apparent that the Europeans recognize the situation in its entirety more fully than Americans and consequently they are more willing to submit to methods which give increasing security and which tend eventually to eradicate the disease. It is recognized as a great scourge which became widespread before the significance of its existence was recognized. In all of the methods the cases of open tuberculosis are considered dangerous and are to be eliminated.

On the other hand clinically sound cattle which react to the tuberculin are not considered dangerous to any great extent at least, and the owners of such cattle sell the milk in open market, while in this country such an act would not be permitted. This makes the methods of Ostertag, Bang and the Manchester procedure possible.

Again owners of tuberculin reacting cattle are allowed to dispose of them as they please, thereby being able to eliminate infected animals to the greatest possible advantage and to establish sound herds at a minimum expense. The methods that are employed to eliminate bovine tuberculosis in several of the countries may be divided into two classes; the first which may be called the direct method consists of the government giving direct assurance to the cattle owner to aid them in their efforts to eradicate the disease from their herds. The second, which may be called the indirect method consists in certain local regulations to protect the people of the community against the danger of tuberculosis infection from milk and this indirectly interferes with the natural dissemination of the disease among cattle. While the method of Bang, which consists in isolating the diseased animals from the healthy and thus maintaining two herds and raising the

calves from pasteurized or sterilized milk is used very extensively in Denmark, this method, however, is not looked upon with as much favor in other portions of Europe.

The method at the present time which is receiving much attention in Germany is that proposed by Ostertag. It consists in eliminating by slaughter all clinical cases, removing the calves promptly after birth from the dams and keeping them separated for some months after which they are placed with the other cattle. During this time the calves are fed upon the milk of sound cows or on pasteurized milk of the infected ones.

The procedure which is known as the Manchester method and which is used in England at the present time consists in taking milk from the dealers and examining it at regular intervals for tubercle bacilli. If tuberculosis is found the examination extends to the individual cows in the herd from which the milk comes. Prof. Boyce, of Liverpool, states that by this method they have reduced the infected milk supply in the city to six per cent. In Holland at present animals belonging to breeders only are killed and compensated for by the government. Prof. Poels thinks that tuberculosis in cattle must be combatted slowly. He believes that the only way is to kill off the animals suffering with evident tuberculosis. Bangs method is not favored and is even considered impossible. Prof. Poels also lays special emphasis upon physical examination as a means of detecting tuberculosis. He emphasizes the importance of greater skill in clinical examination. It will be seen, however, that these methods differ very radically from those used at the present time in this country.

PUBLIC HEALTH LEGISLATION, NEWS AND NOTES.

By DR. B. L. ARMS,
Director Board of Health Laboratory, Boston, Mass.

MASSACHUSETTS LAW RELATIVE TO THE COMMON DRINKING CUP.*

An Act Relative To The Common Drinking Cup.

Be It Enacted, etc., as follows:

Section 1. In order to prevent the spread of communicable diseases, the state board of health is hereby authorized to prohibit in such public places, vehicles or buildings as it may designate the providing of a common drinking cup, and the board may establish rules and regulations for this purpose.

Sec. 2. Whoever violates the provisions of this act, or any rule or regulation of the state board of health made under authority hereof, shall be deemed guilty of a misdemeanor and be liable to a fine not exceeding twenty-five dollars for each offense.

Sec. 3. All acts and parts of acts inconsistent herewith are hereby repealed.

Sec. 4. This act shall take effect on the first day of October, nineteen hundred and ten. (Approved April 22, 1910.)

Regulations Concerning the Use of the Common Drinking Cup.

At a meeting of the State Board of Health held on July 21, 1910, the following regulations were made concerning the use of the common drinking cup, in accordance with the provisions of Chapter 428 of the Acts of 1910:

On and after Oct. 1, 1910, it shall be unlawful to provide a common drinking cup:

(a) In any public park, street or way.

(b) In any building or premises used as a public institution, hotel, theatre, public hall or public school.

(c) In any railroad station, railroad car, steam or ferry boat.

* Acts of 1910, Chapter 428.

MASSACHUSETTS LAW RELATIVE TO TRADES, PROCESSES OF MANUFACTURE OR OCCUPATIONS INJURIOUS TO THE HEALTH OF MINORS UNDER EIGHTEEN YEARS OF AGE.

Chapter 404 of the Acts of Massachusetts of 1910 provides that the State Board of Health may exclude minors under the age of eighteen years from any trade, process of manufacture, occupation or method deemed by said Board to be sufficiently injurious to the health of such minors as to justify their exclusion therefrom.

Chapter 404, Acts of 1910.

Chapter five hundred and fourteen of the acts of the year nineteen hundred and nine is hereby amended by striking out Section seventy-five and inserting in place thereof the following:

Section 75. The state board of health may from time to time upon the written application of any citizen of the commonwealth, or upon its own initiative, after such investigation as it considers necessary, determine whether or not any particular trade, process of manufacture or occupation, or any particular method of carrying on such trade, process of manufacture or occupation, is sufficiently injurious to the health of minors under eighteen years of age employed therein to justify their exclusion therefrom, and every decision so rendered shall be conclusive evidence of the facts involved therein, except so far as the same may later be revoked or modified by a subsequent decision of the board. Whoever, after being notified that the state board of health has determined that a particular trade, process of manufacture, occupation or method is injurious as above stated, employs therein a minor under eighteen years of age shall be punished by a fine of not more than two hundred dollars and not less than fifty dollars for each offense, unless prior to the time of such employment such determination shall have been revoked or modified so as not to include the employment complained of.

(Approved April 16, 1910.)

The State Board of Health hereby declares the processes named in the schedule hereunder to be injurious to the health of minors within the meaning of Chapter 404, Acts of 1910, provided that the law shall not apply to any factory wherein such special measures are adopted as appear to the State Inspector of Health to be reasonably practicable and meet the necessities of the case:

I. Processes Involving Exposure To Poisonous Dusts or Substances.

1. Processes in the manufacture of white, red, orange or yellow lead.

2. Processes in the manufacture of lead pipe, solder and plumbers' supplies.

3. Cutting metal articles with a mixture of lead and tin, or lead alone.
4. Processes involving exposure to lead and the dust of plumbago in electrotyping.
5. Processes involving the handling of white lead or lead monoxide (litharge) in rubber factories.
6. Lead paint grinding.
7. Lead working in the manufacture of storage batteries.
8. File cutting by hand.
9. Typesetting, cleaning or handling type in printing offices.
10. Glazing in pottery establishments.

II. Processes Involving Exposure To Irritating Dusts.

1. Processes involving exposure to the dust of graphite in the manufacture of stove polish.
2. The operation of bronzing in the lithographing business, and the consequent exposure to bronze powder.
3. Cutlery grinding, and grinding or polishing in the manufacture of machinery, machine parts and metal supplies; and grinding, glazing or polishing on emery or buffing wheels.
4. Cutting, boring, turning, planing, doming, facing or polishing pearl shell.
5. Talc dusting in rubber works.
6. Sorting, dusting, cutting or grinding rags.

III. Processes Involving Exposure to Poisonous Gases and Fumes.

1. Spreading rubber on cloth and the subsequent exposure to naphtha in the manufacture of rubber goods.
2. The use of naphtha in cement work in rooms in shoe and rubber factories which are not provided with mechanical means of ventilation where the mixture containing naphtha is allowed to remain in uncovered receptacles.
3. Processes involving exposure to naphtha in the manufacture of japanned or patent leather.
4. Exposure to escape of fumes of gases from lead processes.

IV. Processes Involving Exposure To Irritating Gases and Fumes.

1. Gassing in textile factories.
2. Singeing in print works, bleaching and dyeing works.
3. Dipping metal in acid solutions.

V. Processes Involving Exposure To Extremes of Heat, and Other Conditions Which Promote Susceptibility to Disease.

1. Melting or annealing glass.

(Approved July 7, 1910.)

NEW HEALTH LAWS IN NEW YORK.*

AN ACT in relation to the inferior courts of criminal jurisdiction in the City of New York, defining their powers and jurisdiction and providing for their officers.

SECTION 78. IDENTIFICATION OF PROSTITUTES: FINGER-PRINT SYSTEM. In the night court for women, and such other courts as the boards of magistrates may designate, there shall be established and maintained the method of identification of prisoners known as the finger-print system. The finger-prints of all females convicted under subdivision four of section eight hundred and eighty-seven of the code of criminal procedure, subdivision two of section fourteen hundred and fifty-eight of the consolidation act or section one hundred and fifty of the tenement house law, shall be taken by purpose. Three impressions shall be made of all such finger-prints. One impression shall be classified and preserved in the court where the same was made; a second impression shall be promptly delivered to and classified and preserved in the office of the chief clerk of the division, and the third shall be forthwith delivered to the police commissioner. The board of city magistrates of each division shall designate a day court at which shall be arraigned women charged with the violation of the provisions of law in this section referred to, at which said court said finger-print system shall be established and maintained, in order that all persons convicted of the offenses in this section mentioned, whether arraigned in the day time or at night, shall be identified in the manner described.

SEC. 79. MEDICAL EXAMINATION OF PROSTITUTES. On and after the first day of September, nineteen hundred and ten, any person who is a vagrant, as defined in subdivision four of section eight hundred and eighty-seven of the code of criminal procedure, or who is convicted of a violation of subdivision two of section fourteen hundred and fifty-eight of the consolidation act, or of section one hundred and fifty of the tenement house law, shall after conviction be taken to a room adjacent to the court room, and there be physically examined by a woman physicain of the department of health detailed for such purpose. After such examination the physician making the same shall promptly prepare and sign a written report to the court of the prisoner's physical condition, and if it thereby appears that the prisoner is afflicted with any venereal disease, which is contagious, infectious or communicable, the magistrate shall commit her to a public hospital having a ward or wards for the treatment of the disease with which she is afflicted for detention and treatment for a minimum period fixed by him in the commitment and for a maximum period of not more than one year; provided, that in case a prisoner so committed to any institution shall be cured of her venereal disease, which is contagious, infectious or communicable, after the expiration of the minimum period and before the expiration of the maximum period for which she was committed to the institution, she shall be discharged and released from custody upon the written order of the officer in charge of the institution or of the department of health that the prisoner is free of any venereal disease which is contagious, infectious or communicable. If, however, such

* By Authority Chap. 659.

prisoner shall be cured prior to the expiration of the minimum period for which she was committed she shall be forthwith transferred to the workhouse and discharged at the expiration of said minimum period. Nothing herein contained shall be construed to limit the authority of a city magistrate to commit any prisoner for an indeterminate period to any institution now having authority by law to receive inmates for detention for a period of more than one year.

SEC. 89. COMMITMENTS TO STATE REFORMATORY FOR WOMEN AT BEDFORD. Whenever a woman between the ages of sixteen and thirty is convicted in the city of habitual drunkenness, of being a common prostitute, of soliciting on public streets or places for purposes of prostitution, of frequenting disorderly houses or houses of prostitution, or of vagrancy under subdivisions three or four of section eight hundred and eighty-seven of the code of criminal procedure, she may be committed to the state reformatory for women at Bedford, pursuant to the provisions of section two hundred and twenty-six of the state charities law, to be there confined subject to the provisions of such law and of any stautue relating to such reformatory.

Became a law June 25, 1910, with the approval of the Governor.

Passed, three-fifths being present.

DAMAGE SUIT ON ACCOUNT OF TYPHOID FEVER.*

Lieut. Carndale, of the Royal Navy of Great Britain, sued the proprietor of the Sun Hotel. It came about this way: The lieutenant took dinner at the hotel and ate six oysters. The oysters were raw. And then the lieutenant came down with typhoid fever. Whereupon he suspected the oysters. And then it came to light that the oysters came from a condemned bed. But it further came to light that the hotel keeper did not know of the bed being condemned or even dangerous. In the suit it was alleged that the guest relied upon the care and skill of the hotel keeper and ate what was set before him, and it appeared to the court that the hotel keeper had not exercised sufficient care in selecting his oysters.

The court found a verdict to the effect that typhoid fever was contracted as a result of eating raw oysters; that the guest had relied upon the care and skill of the hotel keeper; and that the hotel keeper was negligent of his duty in not caring better for the safety of his guests; and that the hotel keeper must pay the guest two hundred and sixty-four pounds.

All this occurred in the British dominions, but it might have occurred in Florida, except, perhaps, the verdict—what would it have been?

* Florida Health Notes.

CALIFORNIA STATE BOARD OF HEALTH NOTES.

The first of October the California State Board of Health passed the following resolutions:

"WHEREAS, It is the duty of the California State Board of Health to encourage and maintain a progressive campaign against all communicable and avoidable diseases which may endanger the health of the citizens of the State, and

"WHEREAS, The communicable diseases due to syphilis and to gonococcus infections are among the most prevalent and most harmful known to Medical Science, and

WHEREAS, the policy of the State Board of Health, of physicians, and of educators has hitherto been one of silence on this subject, therefore be it

Resolved, That the California State Board of Health declares that beginning January 1st, 1911, syphilis and gonococcus infections shall be reportable and shall be placed on the list of communicable diseases which local Boards of Health and Health Officers are required to report to the Secretary, it being provided, however, that until further action by this Board, physicians may report the facts concerning these diseases by office numbers instead of names of patients. Be it further

"*Resolved*, That this Board officially calls the attention of the citizens of California to the contagious and infectious nature of these diseases and request their co-operation in combating them by every available means—educational, sanitary, medical, social and moral."

This is certainly a great step in the right direction and the effect will be closely watched by all. California is doing a great work toward the education of the people and it is only through education that will arouse public sentiment that the greatest good will be accomplished.

How long before other States will follow?

NEW HEALTH OFFICER FOR PALO ALTO, CAL.

Herbert O. Jenkins, A. B., of Stanford University, California, for the past three years a graduate student of Massachusetts Institute of Technology, taking the Biological Course, has accepted the position of Health Officer of Palo Alto, California, where he will have supervision of the water and milk supplies and diagnostic work in addition to the general duties of Health Officer.

BOSTON BOARD OF HEALTH LABORATORY NOTES. For the third time in five years the Boston Board of Health Laboratory has been called on to furnish a man for the Middle West. In September, 1905, Dr. H. W. Hill, Director of the Laboratory since its establishment in 1898, was called to Minnesota. Burt R. Rickards, S. B., who succeeded him as Director, responded to a call from Ohio in 1908, and now Dr. Francis H. Slack, formerly in charge of this department of the JOURNAL, has left to accept the position of Professor of Bacteriology at the State Agricultural College at Manhattan, Kansas. Dr. Slack was born in Abington, Mass., where he passed his boyhood and youth; he graduated from Tuft's Medical School in 1898, after which he went to Taunton, Mass., as Apothecary at the Taunton State Hospital, 1899–1900, interne and assistant Pathologist at the same place 1900–1901, was Admitting Physician at the Boston Dispensary, Boston, 1902–1904.

In May, 1904, he was appointed as Milk Bacteriologist to the Boston Board of Health and while in this position devised many methods and pieces of apparatus which are in common use today where bacteriological milk work is done.

When the Laboratory Section of the American Public Health Association at the Boston meeting in 1905 appointed a Committee to study the various methods used for the Bacteriological examination of milk and to recommend a uniform procedure Dr. Slack was made one of the Committee and in 1907 was made Chairman.

All members of the American Public Health Association are cognizant of the quality and quantity of work done by this Committee, the final report, made at the Richmond Meeting, appearing in this JOURNAL, June, 1910, pp. 315–345. In 1905 he was appointed Assistant Director and Director in 1908.

Among the papers he has written are: "The Microscopic Estimate of Bacteria in Milk," "The Comparative Value of Bacterial and Temperature Regulations for a City's Milk Supply," "Methods of Bacteriological Examination of Milk," "Longevity of B. Tuberculosis in Sputum," "Diphtheria Bacillus Carriers in the Public Schools." "A Resume of Diphtheria Examinations Made in the Boston Laboratory During 1909."

By promotion, Dr. B. L. Arms becomes Director of the bacteriological laboratory of the Board of Health, and E. Marion Wade, B. A., Asst. Director. Dr. Charles F. Whitney, who was appointed Asst. Bacteriologist in July to fill the vacancy caused by the resignation of Dr. W. S. Blanchard who returned to his Alma Mater, Tufts Medical School in June to accept the position of Instructor in Pathology and Bacteriology, becomes Bacteriologist. Dr. James J. Scannell, Milk Bacteriologist in this laboratoey in 1906–1907, and since then in general practice, was appointed Asst. Bacteriologist, October 22d.

ANNOUNCEMENTS AND COMMUNICATIONS.

IMPORTANT LEGISLATION: It is of the utmost importance to all scientific journals, such as the Journal of the American Chemical Society, the Journal of the American Medical Association, and this Journal, that the Dodds Bill, now before the Committee on Post Offices and Post Roads, be passed by the National Senate during its winter session. We strongly urge YOU to write to your present senators, requesting the passage of this bill.

SENATOR DICK (OHIO) IN FAVOR OF DODDS' BILL.

In a recent letter to the managing editor of this Journal, Senator Dick says: "It affords me great pleasure to say that I am in entire sympathy with the purposes of the Dodds' Bill to which you refer, and any assistance I can render in securing its enactment into law at the coming session of Congress will be gladly given."

CHICAGO AND BOSTON DEATH RATES:

AUGUST 11, 1910.

Dr. Samuel H. Durgin, Editor, American Journal of Public Hygiene, Boston, Mass.

DEAR DOCTOR: In your issue of June, 1910, on page 378, there appears an article by Dr. W. H. Davis, entitled "Boston and Chicago Death Rates," which I think should not go unanswered.

The paper is strangely unscientific. It contains reflections upon the accuracy of Chicago mortality statistics, which should be refuted out of justice to the Bureau of Vital Statistics of the Chicago Department of Health. No good purpose can be served by allowing these statements to go unchallenged. A proper regard for the science of vital statistics demands that certain other points be discussed.

The first point made by Dr. Davis is a correction of the crude death rate for Chicago and Boston according to the nativity and age indices found in the registration area. A study of this point, to be of value, would require that many, many additional factors be considered. For example: A Polish population newly come

into a section is almost wholly an adult male population; its infant mortality would be negligible. Ten years later that same population would have a large infant population and a high infant mortality. In ten years more that same population would have a relatively smaller infant mortality.

My only criticism of this point is that while it is quite proper in its tendencies it disregards so many vital factors as to be unweighable as evidence.

Corrections founded on an accurate study would be very valuable. Nevertheless Dr. Davis proceeds to add his corrections as though they were actualities, and represented a full study of the subject. All through his paper these so-called corrections are employed.

The doctor's second point is a correction based upon the larger percentage of the total number of deaths in Boston among non-residents than in Chicago. He then adds to the Chicago totals the same ratio of non-residents as shown in the Boston figures. These additions are figured in the tables quite regardless of whether he is figuring infant or adult mortality. The assumption is that a certain number of thousands of non-residents dying in Chicago are gotten out of Chicago without appearing in the totals. This, of course, is not true. He does not even claim it is true. He merely figures that if the figure in Boston is so and so, then in Chicago it must be something else.

I do not know what the explanation of the difference between the Boston and Chicago non-resident figures is, but this is what occurs to my mind:

The Massachusetts General Hospital is a state hospital. The poor who drifted in are recorded against the place from which they came. The Cook County and Dunning Institutions are county institutions. Legally they are open alone to residents of Cook County. A large part of the winter mortality from pneumonia and of the general mortality from consumption are among the drifters of society, men who can scarcely say they have a home anywhere. Our months of heaviest mortality are those in which many thousands have drifted in from the lakes, railroads and fields to lie up in Chicago and drift out when the spring opens up. Those among this class of drifters who die generally die in Cook County Hospital or the Dunning Institutions, and the deaths

occurring in both of these institutions are figured in the Chicago mortality.

I doubt if any correction should be made for differences in non-resident deaths. If there should be it should not apply in equal ratio to infants. It should only be after much closer study of the decedents than has been made here.

The correction for sex is too slight for any consideration.

The principal correction is that based upon the statement that the Chicago returns are inaccurate. Here the Doctor works his figurer again and adds 2940 to Chicago's death record, and, with a moderate sprinkling of "ifs" proclaims the Chicago rate as "16.67 instead of 14.94."

This is an age of publicity. The newspaper is abroad in the land. The gentleman from Boston may be guileless enough to believe that we could secrete 2940 deaths a year in Chicago and not be found out, but I think he would stand alone in his innocence.

In 1900 the census enumerators in Chicago made a return of the deaths reported as having occurred in Chicago. They reported 1930 deaths as having occurred at given numbers during the census year which were not found on the registration books of the Chicago Health Department as having occurred at the numbers given and during the year under investigation. They failed to find 40 per cent. of the deaths which we have recorded. Now, why doesn't some one claim that our death returns are 40 per cent. too high? Up to this point, which seems the more accurate, the returns of the Chicago Department are those of the census office. As soon as the census figures appeared they were investigated.

Regarding the addition of 1930 deaths to Chicago's mortality record for the census year 1900 by the U. S. Census Bureau authorities, the following statement is made by the Chicago Department of Health:

For the Census Year of 1900 (June 1, 1899, to May 31, 1900), the U. S. Census Office collected mortality statistics for certain cities in two ways—one, by having transcript made of the official records of death on file in the Department of Health; the second, by having census office enumerators in their house-to-house canvass enquire as to deaths that occurred *within* the census year, recording all such deaths on blank forms for that purpose.

In the Census Office the Health Department records were checked with the enumerators' returns and all enumerators' records not found on the records of the Health Department were added to the mortality records of that city. By this method the Census Office added 1930 deaths to Chicago's official returns.

As soon as this came to the attention of the Commissioner of Health in Chicago a request was addressed to the Director of the Census asking that a transcript of the added records be supplied to the Chicago Department of Health that the same might be run down and any errors or omissions corrected.

The transcript was furnished in due season setting forth the following data which might serve for purposes of identification: (a) Name of decedent; (b) color; (c) sex; (d) age; (e) social status; (f) date of death; (g) cause of death; (h) attending physician—*but not the place of death.*

Trained investigators were assigned to the work but it was soon found that it would take months of labor to run down the entire list of supposed omissions and therefore it was decided that the first 200 entries should be thoroughly investigated and results accepted as an index of the whole list of 1930 entries.

The results of the investigations of the first 200 entries on the transcript of enumerators' records which were added to the Chicago official records were as follows:

One hundred, or exactly one-half of the 200 deaths supposed to be missing from the Chicago mortality records, were found on the Health Department records, and 100 could not be located on records or by searching inquiry of reported attending physicians, or coroner's office records, or on reference to city directories. Fifty-four, or more than half of the traced records, were found to be deaths that occurred outside of the Census Year (before June 1, 1899, or subsequent to May 31, 1900)—26 were found within the census year included in our transcript, but the enumerators had so grossly misspelled the decedents' names that the records could only be identified on comparison of other data—16 were deaths of Chicagoans who had died in other parts of the country, their bodies having been shipped to Chicago for burial and under such circumstances these deaths not chargeable as Chicago deaths; (to more than offset this latter omission we count the death of every non-resident dying in the city; of every person dying on

boats, railroad trains, etc., bodies being brought to Chicago, frequently from distant parts; of every person whose body is removed from Lake Michigan and brought to Chicago for inquest; of every person dying in the County Institutions at Dunning, Ill., which is outside the city limits—the deaths in the latter institutions numbering above 1000 each year)—4 were of infants who had never breathed and therefore true stillbirths and not chargeable as deaths.

One hundred of the enumerators' reports of death—out of the first 200 entries examined—could not be traced even after the most searching inquiry. The names of supposed decedents could not be found in the city directories of 1898, 1899, or 1900, nor were any of them on the poll lists in the Election Commissioner's office. Inquiry was then directed to the *reported* attending physician, that is, in such cases as the *reported* attending physician could be found, and here let it be said that in the majority of instances the "attending physician" appears to have been a purely fictitious individual. In such of these cases where the attending physician was found the physician denied having attended any such case and furthermore denied knowledge of any such patient. Seven of these non-traceable enumerator's records were of deaths from violence, therefore Coroner's cases. Search of the Coroner's records failed to reveal any such names as those reported, and by none other of the given data could they be identified. It is beyond possibility for violent deaths to occur and escape detection in any such proportion as these records would indicate. Either the names of the decedents and other relating data are so grossly misstated as to be impossible of identification when compared with the official records or the enumerator's records of such are purely fictitious.

But one conclusion is possible from this statement of facts, and that is that the action of the Census Office in adding the unchecked enumerators' returns of death to the official record of deaths of Chicago was wholly unwarranted and renders the statistics of deaths for Chicago for the Census Year of 1900, as published by the Bureau of the Census, inaccurate, misleading and worthless. The census of 1910 has abandoned this method.

Early in 1906, the Chicago Medical Society having learned of the statements made in the census report, appointed a committee

to investigate the accuracy of the vital statistics of the Chicago Health Department. In the Health Department Bulletin dated April 28, 1906, is that report:

"Among many reasons the following may be given why the committee believe that the Health Department is obtaining reports and recording all the deaths that occur in the City of Chicago and is making accurate use of the same in the compilation of vital statistics:

"1. No permit for the burial or shipment of a body can be obtained in the absence of a certificate of death properly signed by a physician.

"2. Certificates of 'Unknown Cause' of death are invariably referred to the Coroner for his certificate as to the cause of death.

"3. Bodies found in the lake or waters adjacent to the city, or of persons dying on trains, boats, etc., which are brought into the city, are recorded by the Department in the city's mortality, regardless of the place of death.

"4. Deaths occurring at Cook County institutions, even though oustide of the city, as the Dunning Asylum, Tuberculosis Hospital and the Infirmary, of all persons that were sent there from Chicago are included in the city's mortality.

"5. Registration of deaths now includes all deceased infants that have breathed, but prior to November 1, 1905, infants surviving less than twenty-four hours were classed as still-births.

"6. It is the committee's opinion that no body can be disposed of in the city of Chicago, by burial, cremation or by shipment in a public conveyance, without being recorded by the Health Department. (a) Bodies used for dissection are receipted for by the Demonstrators' Association and recorded by the Department as having been buried in a certain Medical College, based on a certificate returned by the college clerk. (b) Cemetery clerks' records of burials are checked monthly, and must agree with the department records, thus preventing surreptitious interments. (c) Railways or other methods of public transportation will not accept a body for shipment without the Department certificate. Shipment of a body surreptitiously by rail or boat would require the connivance of the undertaker, shipping agent, baggage or expressman, receiving agent and undertaker.

"7. The death rate of the City of Chicago is based on the United States Census Bureau enumeration of the population for 1900, while the Census Bureau estimate of annual increase, which is 0.1 of the increase between the Census enumerations of 1890 and 1900. This method gives a population for 1905 of 1,990,750, the estimated annual increase being 59,872. These figures in the opinion of the committee give too low an estimate, though probably more accurate than the larger estimates of the School Census or the City Directory.

"8. The records of the Department's investigation of the discrepancies between the United States Census Bureau returns for 1900 and those of the City Health Department clearly demonstrate to the satisfaction of the committee the greater accuracy of the Health Department figures, because of the fact that the Health Department's figures were based on official facts (death certificates), while the Census Bureau's figures were based on inquiries.

"Signed,)

ALFRED C. COTTON, *Chairman.*
ADOLPH GEHRMANN, GEO. W. WEBSTER,
WELLER VAN HOOK, J. A. PATTEN,
L. HEKTOEN, N. S. DAVIS."

If we go back to the census report, we find that it did not purport to be or intend to be accurate. It tried, in a very broad way, to establish which cities were furnishing statistics that were accurate enough for acceptance. It was an indicator and not an accurate check. The government accepted it as indicating that Chicago was not only up to the standard of accuracy but was above the average, of the towns investigated as indicators. It was not claimed then or there or since or anywhere that the census figures were more accurate than the Chicago figures and nothing was there said which would lead any trained mind to use those figures, as an index, for correction of crude death rates. This very crude method of testing the accuracy of the returns was plainly stated to be what it was. Why Dr. Davis, in a scientific study of vital statistics, should have disregarded the plain meaning of words is difficult to understand.

Dr. Cressy L. Wilbur, Chief of the Bureau of Vital Statistics, Department of Commerce and Labor, in discussing Dr. J. N. Hurty's paper before the Section on Hygiene and Sanitary Science of the American Medical Association, said: "At Washington we are receiving statistics from all registration states and cities, and there is no city in the union which sends better reports or where the causes of death are more perfectly run down than Chicago."

If Dr. Davis will read the Bulletin of the Chicago Health Department he will find some things which will interest him. For interest in the Bulletin of Jan. 1, 1910, he will read:

The factors making for Chicago's good health may be briefly summarized as follows:

First—and most important: A very large percentage of our citizens are young and sturdy—the physical cream of every foreign land and every state.

Second: The great body of purifying water, Lake Michigan, at our front door.

Third: Our purifying winds.

Fourth: Right living.

Fifth: Governmental control.

For the first three of these we have no right to plume ourselves, and while we have every right to be congratulated for our good luck, we have no right to claim superiority over our fellows for good living.

These statements are clear, direct, concrete. While they are not accurate, they do not pretend to be. They cover the case.

I am sorry that it has been necessary to call the attention of this Journal to these errors, but it did not seem to me to be wise from the standpoint of Chicago or of statistics in this country to have them pass without contradiction.

Having read some of the valuable logarithmic calculations of factors for correction of vital statistics for England and certain continental countries, I have disliked exceedingly to find Dr. Davis departing from the fairly well established scientific method.

Yours very truly,

(Signed) W. A. Evans,

Commissioner of Health.

Chicago, Ill.

NOVEMBER 7, 1910.

Dr. Samuel H. Durgin, Editor, American Journal of Public Hygiene, Boston, Mass.

DEAR DOCTOR: A brief reply to Dr. Evans, Commissioner of Health of Chicago, will not, I trust, be out of place.

The paper, "Boston and Chicago Death Rates," was intended to show that the uncorrected death rates of Boston and Chicago ought not to be taken as indices of the relative health conditions of the two cities. The paper did not pretend to discuss all the differences existing in the two cities—for example: In Chicago it is customary to reckon as Chicago deaths certain deaths occurring in institutions outside of Chicago, while in Boston such deaths are credited to the towns or cities in which they occur. Again, in Chicago, previous to 1905, deaths of children less than twenty-four hours old were classed as still-births, while in Boston deaths of children who have breathed at all have always been included in the total deaths. Many other minor differences doubtless exist which would require consideration to determine absolutely the needed corrections for death rates. But my paper and charts as presented, dealing with the needed corrections for age, color, parent nativities and non-residents, were sufficiently complete to show how absolutely worthless are deductions drawn from uncorrected death rates.

Dr. Evans maintains that the relative ages of a Polish immigrant population just arriving in this country will change so greatly in ten years that the figures of the 1900 census for example, become "unweighable as evidence." In 1900 the census figures must be considered as accurate. As we get farther and farther away from the Census year, it is well understood by every one that calculations based upon the Census figures become less and less reliable. But, I maintain that the corrections found necessary for 1900 were even in 1909 "weighable as evidence," for immigrants were coming to this country many years before 1900 and in 1909 were still coming, so that the relative ages of the immigrant population probably had not changed so very much. Certainly, in the absence of more recent population figures for comparison, it seems fair to use the corrections found necessary in 1900 until the details of the 1910 census become known.

Dr. Evans says: "The assumption is that a certain number of thousands of non-residents dying in Chicago are gotton out of Chicago without appearing in the totals. * * * * He figures that if the figure in Boston is so and so, then in Chicago it must be something else." No such assumption was either made or intended. The statement in the paper seems perfectly clear, and was as follows: "If the deaths of non-residents had affected Chicago, as much as they did Boston, Chicago's death rate would have been raised 1.71."

From Dr. Evans' letter, it appears that decedents having an unknown residence are reckoned as residents of Chicago. This is also true in Boston. The Massachusetts General Hospital, by the way, is not a state hospital.

Dr. Evans continues: "The principal correction is that based upon the statement that the Chicago returns are inaccurate."

Now, far from being the principal correction, the question of inaccuracy is not included at all in the corrections indicated in the tables and charts, and is only mentioned briefly upon the authority of the 1900 census. Dr. Evans' explanations on this point are given in great detail and should be gladly accepted by all.

Using the population figures of the 1900 census, it was found necessary to add 3.99 to Chicago's death rate as a correction for ages, color, nativities and non-residents, when comparing that city with Boston. It will be very interesting to see what the correction will be when based upon the figures of the 1910 census.

Very truly yours,

(Signed), WILLIAM H. DAVIS,

Vital Statistician, Boston Board of Health.

BOOK REVIEWS.

The Sources and Modes of Infection. By Charles V. Chapin, M. D., Sc. D., Superintendent of Health, Providence, R. I., Author of "Municipal Sanitation in the United States." First edition. New York: John Wiley & Sons. London, Eng.: Chapman & Hall, Ltd. Cloth, $5\frac{1}{4} \times 8$ ins.; pp. 399. $3.00, net.

Sanitarians have for several years eagerly awaited Dr. Chapin's book on infection; and the anticipations excited by his shorter papers on the subject are more than realized in this admirable volume. It was to be expected that the scientific openmindedness of the author would lead to generally sound results but the exhaustiveness with which his conclusions are enforced by detailed citations from original authorities cannot fail to surprise those who are acquainted with the demands made upon the sanitary executive of a large city.

Dr. Chapin's book "is intended to indicate the principles which should guide sanitary practice; and to show how recent laboratory work and the epidemiological study of disease have modified these principles." He reviews first the bacteriological evidence in regard to the life of disease germs outside the body which shows that "while it is possible that the anthrax and tetanus bacilli and the pus-forming bacteria may develop in the soil, there is no evidence that they commonly do so. It is also possible that the typhoid bacilli, and to a still less extent the bacteria of cholera, dysentry and plague, maintain a limited saprophytic existence, but this is probably very unusual. There is ample epidemiological evidence that in temperate climates such a source for these diseases must be an almost infinitesimal factor in their development. Probably the diphtheria bacillus never has a saprophytic growth of any significance, unless possibly very rarely in milk. As for tuberculosis, pneumonia, influenza, cerebro-spinal meningitis, scarlet fever, typhus fever, small-pox, whooping cough, gonorrhea and syphilis, malaria, yellow fever and sleeping-sickness, there is not the slightest reason for supposing that they ever develop outside of the bodies of animals."

The human body is thus the important source of danger; but as Dr. Chapin points out in his second chapter, on carriers and missed cases, it is by no means only the obviously sick who are to be feared. In pneumonia, in epidemic cerebro-spinal meningitis, in diphtheria and in typhoid fever, there is ample evidence of the important part played by mild cases, by convalescents, or by those who carry virulent bacteria without any symptoms of disease. Dr. Chapin points out that the existence of these carrier-cases profoundly affects the problem of isolation of the sick and necessitates considerable discretion in its enforcement.

These chapters on the source of infection in the human body are followed by a discussion of the modes by which it spreads from person to person. Dr. Chapin first takes up the question of Infection by Fomites and Infection by Air in two of the most important chapters in the book. He begins this discussion by showing how strong the evidence once appeared that yellow fever was spread by fomites. He says: "The proofs that it is a fomites-born disease were far more numerous and stronger for yellow fever than for almost any other disease. Yet we now know that yellow fever never was, nor could be, transmitted in such a way. Such a mistake, a mistake which cost millions upon millions because of the needless interruption of commerce, and disinfection, should make us careful how on similar, but weaker evidence, we attribute importance to fomites as a means of infection in other diseases." The epidemiological evidence of the spread of disease by things rather than by persons proves indeed on examination to be almost *nil*, and Dr. Chapin's own experience in giving up disinfection after diphtheria in Providence with no disastrous effects is almost a demonstration of the practical inutility of the ordinary procedure. His final conclusion that "there is no good epidemiological evidence that any disease except those due to spore-forming bacteria are to any great extent transmitted by fomites" seems fully justified by the facts.

Similarly the bogey of air-borne infection fades away before a scientific analysis. Even in the case of small-pox "the evidence in favor of the aerial transmission" is so slight that it should never influence a municipality in its selection of a hospital site." Dust and mouth spray and sewer gas are shown to be of limited importance; "most diseases are not likely to be dust-borne, (and they

are spray-borne only for two or three feet), a phenomenon which after all resembles contact infection more than it does aerial infection as ordinarily understood." We come back to the individual and his fresh excreta, as the central point of danger. To erect adequate barriers between him and his fellows is the chief task of the sanitarian.

The really vital and important vehicles of infection are reviewed in three chapters on Infection by Contact, Infection by Food and Drink, and Infection by Insects. These are the modes by which fresh and infected excreta are carried from the infected to the normal person. All are well handled by the author and on such vexed questions as the part played by milk in the spread of tuberculosis and by flies in the transmission of typhoid fever his conclusions are moderate and judicious.

The chapter on contact should prove of special value as the importance of this mode of infection is still inadequately grasped by sanitary authorities, particularly in the case of typhoid fever. The spread of gonorrhea by nurses in the Babies Hospital in New York forms a striking contrast with the striking success obtained at the Pasteur Hospital in Paris and at the Monsall Hospital in Manchester where all sorts of contagious diseases are treated in open wards but with special precautions for "*antisepsie medicale.*"

As Dr. Chapin says, "sanitary science is far from exact"; and he adds in another place, "I would be the last person to assert that the views here set forth are unassailable and unalterable. They doubtless will be modified; it may be that they are entirely erroneous." It seems to the reviewer, however, that in all essential points Dr. Chapin's conclusions are in accord with the evidence now available and form a sound compendium of the present status of sanitary knowledge.

The book might be justly criticized from one standpoint on the ground that its emphasis is so largely on things the health officer should not do, rather than on those he should do. Its effect on some readers will no doubt be to inspire a certain feeling of discouragement as to the whole public health program. Just such a book is much needed, however, today, when so much inherited rubbish cumbers the sanitary workshop. Dr. Chapin's book should be studied and re-studied by every official entrusted with the expenditure of public funds and the conduct of public

education in sanitary matters. It will save much waste of municipal appropriations and will prevent the dissemination of much harmful misinformation. Perhaps some day Dr. Chapin or some one equally qualified will write a book on the constructive side about positively helpful lines of board of health work and their relative importance; but such a book can be written better in five years than today.

C.-E. A. WINSLOW.

Education in Sexual Physiology and Hygiene. By Philip Zenner. Robert Clarke Co., Cincinnati.

As stated on the title page this is "A Physician's Message." The book is published by the Robert Clarke Company, of Cincinnati, and contains 126 pages of well worded and practical information on methods of presenting the facts of sex-hygiene and physiology to the schools and the public. The first half of the book gives the substance of four excellent talks which the author gave before students from twelve to sixteen years of age. The first three—(1) Hygiene, (2) Habit, (3) Alcohol—were given before mixed classes, the fourth, or "sex talk" was given to the boys alone (a similar talk being given by a woman physician to the girls). The reader appreciates, as he reads these talks, the force of the author's repeated warning, that "the instruction should be given so as to do the most good, and the least harm possible, especially so as not to arouse morbid fears"; that "the aim should be, instead, to inspire high ideals which ennoble life." The talk before college boys is excellent and to the point.

The last three chapters on "Mode of Teaching," "The Teacher", and "An Added Word", should be read by all persons intending to identify themselves with this new movement in health conservation. It is evident that the author believes that more harm than good results from much of the so-called sex-teaching. Since the child usually gets information—or mis-information rather—at an early age on the street, and often acquires bad habits early, and not rarely disease, and since "one-half the children leave school before they are twelve or thirteen years old"—"what school instruction they are to get they must receive before that age."

The author makes a good point in advocating such instruction to be given "verbally rather than by book or phamphlet." Specially trained teachers are advocated—"To-day there is nowhere training of this kind. It should be the function—and, really one of the most important functions—of normal schools and universities to give this instruction."

The final chapter deals with the value of athletics as a "safety-valve," and with the crowded tenement house, lack of privacy, and low wages as factors in the problem. The conditions which all but prevent early marriages are given due weight.

Altogether the book is an excellently written, sincere, helpful outline of what a well informed physician has done in this difficult field of education. The book should have a wide distribution among teachers, and parents.

WILLIAM F. SNOW.

Berkeley, Cal.

Infant and Child Mortality. Report by Arthur Newsholme, M. D., Medical Officer of Local Government Board, England, 1910. Price, 1s. 3d.

This interesting report contains among other valuable material a statistical study of the question whether excessive infant mortality exerts a selective action by weeding out the unfit. Data from many localities are given which show that high infant mortality is associated with high mortality in subsequent years and also that the converse is true. There is then no indication that excessive infant mortality improves the resistence of the race, though Newsholme guardedly says that the study is not complete enough to demonstate that this may not be so. The diseases most prominent in infant mortality are discussed, and also the underlying causes. Of course the ignorance of mothers is one of the most important, but Newsholme considers that municipal uncleanliness also is very important and for this there is little excuse. The first duty of the municipality is to provide such an environment as will encourage not discourage domestic cleanliness. Various other means for reducing infant mortality are discussed such as visiting nurses, milk stations, better midwives and better registration of births. Other reports on this subject are promised and will be awaited with much interest.

The Conquest of Disease Through Animal Experimentation. By *James Peter Warbasse, M. D. New York and London: D. Appleton & Co. 1910.*

The agitations of antivivisectionists have begun to be almost continuous in some states of the country. Misleading literature they are sending broadcast among otherwise uninformed people: public exhibits of laboratory apparatus and procedures they are setting up in places where crowds congregate; and with morbid imagination the attendants, who have never seen inside of a biological laboratory, are explaining the "horrors" which they portray. Such efforts to create a sentiment in favor of the abolition of the most fruitful method of medical research is a direct menace to public health—a menace which is likely to be too little regarded.

As a means of correcting misconceptions which have been disseminated Dr. Warbasse has stated in terms easily understood some of the reasons for the application of the experimental method to living animals. The value of the method for teaching purposes, for the development of biological knowledge, and for the advancement of medicine and surgery is dealt with in a simple and straightforward manner. His discussion of the meaning of animal experimentation, the nature of pain, and what constitutes cruelty, is likely to be especially illuminating to the layman. And if the layman is ready to accept the dicta with which the book begins, that "life is the loftiest consummation of all natural energy," and that "human life should be the supreme object of human interest," then Dr. Warbasse's interesting account of the practical results that have come as great benefits to mankind from experiments on animals, will make a strong appeal for freedom of research. The results described include those that have enriched physiological knowledge, as well as those which have proved useful in the practice of medicine, in the preservation of public health, in the procedures of the surgeon, and in the saving of animals themselves from pain and death. The final chapter, devoted to a discussion of the antivivisection movement, and to the character of its adherents, is not likely to be relished by them, but it nevertheless is a fair statement of the perversity of their estimation of values.

Boston. WALTER B. CANNON.

Sewage Disposal. By Leonard P. Kinnicutt, Director Dept. of Chemistry, Worcester Polytechnic Institute; C.-E. A. Winslow, Asst. Professor of Biology and Biologist in Charge of the Sewage Experiment Station of the Mass. Institute of Technology; R. Winthrop Pratt, Chief Engineer of the Ohio State Board of Health. Published by John Wiley & Sons, New York City. Price, $3.00.

This octavo book of 421 pages consists of a well blended recital of American and European, especially English, experiences which have established the principal features now recognized in the science and art of sewage disposal. Almost without exception it is free of views that are either radical or so old fashioned as to be regarded as superseded.

The chemical and biological aspects of the book are more comprehensive and detailed than those of an engineering nature. Probably this is wise in a book of this size on a subject of such a wide scope as this one and which is undergoing such rapid changes in some of the more important aspects of engineering practice. Numerous references are given to details of results obtained from the findings of the Royal Commission on Sewage Disposal of Great Britain, as well as the results of tests and practical operations in America and abroad, especially in England. References are rather meager as to German investigations and experiences. To some extent the same is true of the results of current practice in the design and operation of disposal works in the United States other than in Massachusetts and Ohio.

The chapters on the composition of sewage, on sedimentation and on screening are good general reviews of reliable literature. Chemical precipitation, intermittent filtration, broad irrigation and sewage farming are tersely but comprehensively reviewed, giving the reader a good impression with regard to their respective efficiency, economy and availability.

Dilution is recognized as "a real method of purification," proper and economical under some circumstances. The details of the chapter scarcely do justice to American experiences with this method of avoiding nuisance. Particularly in one respect is it quite possible that the reader may be misled, on page 38, where in discussing a safe residual quantity of dissolved oxygen it is

stated, that "practically, any value below 50% of saturation is likely to be accompanied at times by malodorous conditions." On this basis the Merrimack River at Lawrence, serving as the source of the filtered water supply of that city, comes at times into the questionable class with respect to satisfactory disposal by dilution of the sewage from the cities above Lawrence.

The chapter on septic tank treatment is good and can be read with advantage by many engineers who do not distinguish clearly between septic conditions and the mere exhaustion of dissolved oxygen from sewage which turns dark colored in numerous long outfall sewers. The chapter is also of interest in indicating the manner which the village of Saratoga Springs has obviated any payments of royalty to the Cameron Septic Tank Co.

The development of the Emscher tank as a step in advance of the Hampton tank, and whereby sludge is septicized in separate compartments to a point of substantial freedom from odor, in accordance with the experience of scores of places in the Emscher District in Western Germany, is touched upon very briefly.

Coarse-grained filters both of the contact type and of the percolating (sprinkling) type are described in much detail. The outline of their nature and performances is good. There are very few statements to which exception could be properly taken. Perhaps the most conspicuous point is the expression of the opinion that automatic dosing or controlling devices are not advantageous for contact filters. Experience with several of the excellent devices now available in this country certainly shows them to be conducive both to efficiency and economy.

The chapter on sewage disinfection or sterilization is a well balanced resume of recent progress in this important branch of the subject.

Taking the book as a whole it may be safely said that it will be of much assistance in the class room in teaching this subject to students and especially to the public hygienist desiring to get a general insight into the subject in its broader phases, with ample opportunity to ascertain where the various results with different styles of plants have accomplished definitely recorded results.

New York City. GEORGE W. FULLER.